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(54) REPRODUCING METHOD, REPRODUCING DEVICE, RECORDING METHOD, RECORDING DEVICE, AND OPTICAL DISK

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method and device for interleaving bit stream so that a bit stream can be seamless-reproduced from a multimedia optical disk which is used efficiently by recording data shared by a plurality of titles and has a data structure that realizes such a new function as the multiangle reproduction.

SOLUTION: The data structure is such that a plurality of video objects (VOB) containing compressed video data are recorded on the multimedia optical disk (M) in the order of reproduction in interleave areas (blocks 4 and 6) and continuous areas (blocks 1, 2, 3, 5 and 7) and a management area (NV) in which data are interleave-recorded together with the video data is provided. The information which specifies the information on the end position of the area from which data are read out continuously and the information on the position where the data can be reproduced next on the disk are recorded in the management area.

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CLAIMS

[Claim(s)]
[Claim 1] It is the playback approach which plays an optical disk. Said optical disk The video object containing one or more cels, and the information with which have management information and, as for said management information, said cel indicates it to be whether it exists in the field to which said video object was interleaved, The information which shows whether the type of the cell block containing two or more cels is an angle type is included. Said playback approach The step which reads said management information from said optical disk, and the information which shows whether said cel exists in the field to which said video object was interleaved from said read management information, The playback approach containing the step which extracts the information which shows whether the type of the cell block containing two or more cels is an angle type.
[Claim 2] It is the regenerative apparatus which plays an optical disk. Said optical disk The video object containing one or more cels, and the information with which have management information and, as for said management information, said cel indicates it to be whether it exists in the field to which said video object was interleaved, The information which shows whether the type of the cell block containing two or more cels is an angle type is included. Said regenerative apparatus The means which reads said management information from said optical disk, and the information which shows whether said cel exists in the field to which said video object was interleaved from said read management information, A regenerative apparatus including a means to extract the information which shows whether the type of the cell block containing two or more cels is an angle type.
[Claim 3] It is the record approach including the information it is indicated to be whether it is the record approach which records information on an optical disk, said record approach is equipped with the video object containing one or more cels, and

the step which records management information, and said management information exists in the field to which said video object was interleaved for said cel, and the information which shows whether the type containing two or more cels of a cell block is an angle type.

[Claim 4] It is a recording apparatus including the information it is indicated to be whether it is the recording apparatus which records information on an optical disk, said recording apparatus is equipped with the video object containing one or more cels, and a means to record management information, and said management information exists in the field to which said video object was interleaved for said cel, and the information which shows whether the type containing two or more cels of a cell block is an angle type.

[Claim 5] The optical disk on which information was recorded by the record approach indicated by claim 3.

[Claim 6] The optical disk on which information was recorded by the recording apparatus indicated by claim 4.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] Invention of ********** performs various processings to the bit stream which conveys the information on the dynamic-image data which constitute each title which has the contents with which a single string was related, audio data, and subimage data. A bit stream is generated in order to constitute the title which has the contents according to a request of a user. The bit stream used for the recording apparatus which records the generated bit stream on a predetermined record medium efficiently, a record medium, the regenerative apparatus to reproduce, and an authoring system is interleaved, and it is related with a medium at the approach of carrying out record playback, and its equipment.

[0002] In the system using a laser disc (trademark), a video CD, etc., digital processing of the multimedia data, such as a dynamic image, an audio, and a subimage, is carried out, and the authoring system which constitutes the title which has the contents with which a single string was related is put in practical use in recent years [background

technical].

[0003] Especially, in the system using a video CD, record of dynamic-image data is realized by the dynamic-image compression technique of the high-pressure shrinking percentage called MPEG with the memory capacity of about 600 M bytes on CD medium which was originally an object for record of a digital audio. Karaoke is begun and the title of the conventional laser disc is replacing a video CD.

[0004] Every year, a request of the user to the contents and playback quality of each title is becoming more complicated and altitude. In order to meet the request of such a user, each title needs to consist of bit streams which have a layered structure deeper than before. Thus, by the bit stream which has a deeper layered structure, the amount of data of the multimedia data constituted increases about ten or more times over the past. furthermore, the contents over the details of a title -- the texture top -- it is necessary to ****** -- it -- a bit stream -- more -- a low-ranking hierarchy data unit -- data processing -- and it is necessary to control

[0005] Thus, the bit stream structure which enables efficient control for a lot of digital bit streams which have many layered structures on each hierarchy level, and an advanced digital art including record playback need to be established. Furthermore, the record medium which record-keeping of the equipment which performs such digital processing, and the bit stream information by which digital processing was carried out with this equipment is carried out efficiently, and can reproduce the recorded information quickly is also required.

[0006] If it says about a record medium in view of such a situation, examination which raises the storage capacity of the optical disk used conventionally is performed briskly. Although it is necessary to make small the diameter D of a spot of a light beam for raising the memory capacity of an optical disk, if numerical aperture of lambda and an objective lens is set to NA for the wavelength of laser, said diameter D of a spot is proportional to lambda/NA, and lambda is suitable for it for NA raising memory capacity small, so that it is large.

[0007] However, when NA uses a large lens, U.S. Pat. No. 5, the disk side called a tilt to 235 and 581 like a publication, and the comatic aberration produced with the relative inclination of the optical axis of a light beam become large, and in order to prevent this, it is necessary to make thickness of a transparence substrate thin. When a transparence substrate is made thin, there is a problem said that a mechanical strength becomes weak.

[0008] Moreover, about data processing, MPEG 2 in which fast transfer is possible is developed and used in mass data from conventional MPEG1 by making signal data, such as a dynamic image, an audio, and graphics, into the method which carries out record playback. In MPEG 2, the somewhat different compression method and the data format from MPEG1 are adopted. About the contents of MPEG1 and MPEG 2, and its difference, since it is explained by MPEG specification document of ISO11172

and ISO13818 in full detail, explanation is omitted. Although it has specified if attached to the structure of a video encoding stream also in MPEG 2, the art of the layered structure of a system stream and low-ranking hierarchy level is not clarified.

[0009] Like ****, a lot of data streams with sufficient information to fill various demands of a user cannot be processed in the conventional authoring system. Furthermore, since there is no mass record medium which can use a mass data stream for record and playback enough efficiently even if a processing technique is established, the processed data cannot be repeated effectively and cannot be used.

[0010] In other words, in the unit smaller than a title, in order to have processed the bit stream, the excessive demand to the hardware called large-capacity-izing of a record medium and improvement in the speed of digital processing and the software called design of an advanced digital art including the refined DS needed to be canceled. In this way, this invention is the unit below a title which has an advanced demand to hardware and software, controls the bit stream of multimedia data and aims at offering the effective authoring system which agreed in the request of a user more.

[0011] Furthermore, in order to share data among two or more titles and to use an optical disk efficiently, the multi-scene control which chooses as arbitration two or more scenes allotted on the same time-axis as common scene data in two or more titles, and is reproduced is desirable. However, in order to arrange on the same time-axis, two or more scenes, i.e., multi-scene data, it is necessary to arrange each scene data of a multi-scene continuously. Consequently, since non-choosing multi-scene data must be inserted between the selected common scene and selected multi-scene data, in case multi-scene data are reproduced, the problem referred to as that playback is interrupted in the part of this non-choosing scene data is expected.

[0012] It aims at offering the generation method of the system stream of such DS, a recording device, a regenerative apparatus, and the medium that such a system stream records with the DS which enables seamless playback reproduced without interruption of the data of each scene also in such multi-scene data in this invention. In addition, it applies for this application based on Japan patent application number H7-276714 (September 29, 1995 application) and H8-041587 (February 28, 1996 application), and all the indication matters by these both specifications are made with a part of indication of this invention.

[0013] Indication this invention of invention is the approach of generating a bit stream from two or more video objects containing the compressed video data. A ratio with the playback time amount of the video object which the start point and the ending point of playback of this video object are in agreement, and has the shortest playback time amount length, and the video object except the video object which has this shortest playback time amount length The minimum read-out time amount, The interleave data area which arranged to continuation these two or more video objects that are within the limits obtained by the distance which can be maximum jumped, and

the minimum control unit for every interleave unit with the die length beyond this minimum read-out time amount length, It interleaves so that a playback start point and an ending point may arrange the continuation data area which arranged the independent video object to continuation in order of playback and may generate this bit stream.

[0014] In order to explain best gestalt this invention for inventing to a detail more, this is explained according to an attached drawing.

data **** of an authoring system -- the logical structure of the bit stream of the multimedia data with which the object of the processing is first carried out in the authoring system which includes the recording device in this invention, a record medium, regenerative apparatus, and those functions with reference to drawing 1 is explained. The image and speech information which a user can recognize and understand the contents or can be enjoyed are made into 1 title. This title is equivalent to the amount of information showing the contents of each scene by the perfect contents of one movie, and min at the maximum, if it says on a movie.

[0015] A video title set VTS consists of bit stream data including the information for a title on a predetermined number. Henceforth, a video title set is called VTS for facilitation. VTS contains playback data showing the contents of each above-mentioned title itself, such as an image and an audio, and the control data which controls them.

[0016] From VTS of a predetermined number, the video zone VZ which is 1 video-data unit in an authoring system is formed. Henceforth, a video zone is called VZ for facilitation. K+1 VTS#0 - VTS#K (positive integer in which K contains 0) continue linearly, and are arranged by one VZ. And one VTS#0 of a head is preferably used among those as a video manager showing the contents information on each title contained in VTS. Thus, the multimedia bit stream MBS in an authoring system which is the maximum management unit of the bit stream of multimedia data is formed from constituted VZ of a predetermined number.

[0017] To authoring encoder EC drawing 2 , an original multimedia bit stream is encoded according to the scenario of the arbitration according to a request of a user, and 1 operation gestalt of the authoring encoder EC based on this invention which generates the new multimedia bit stream MBS is shown. In addition, the original multimedia bit stream consists of audio streams St 5 which carry the subpicture stream St 3 which carries auxiliary image information, such as the video stream St 1 which carries image information, and a caption, and speech information. A video stream and an audio stream are streams including the information on the image obtained from an object between predetermined time amount, and voice. On the other hand, a subpicture stream is a stream including one screen, i.e., the image information on instantaneous. If required, the capture of the subpicture for one screen can be carried out to video memory etc., and the subpicture screen by which the capture was

carried out can be displayed continuously.

[0018] As for these multimedia source data St1, St3, and St5, in play-by-play broadcasting, an image and a sound signal are supplied on real time from the means of a video camera etc. Moreover, it is the un-real time image and sound signal which were reproduced from record media, such as a video tape. In addition, in this drawing, it cannot be overemphasized that the source data showing the contents of a title from which it is three or more kinds, and each differs as three kinds of multimedia source streams for facilitation may be inputted. The multimedia source data which have the voice of such two or more titles, an image, and auxiliary image information are called a multi-title stream.

[0019] The authoring encoder EC consists of the edit information creation section 100, the encoding system control section 200, the video encoder 300, the video stream buffer 400, the subpicture encoder 500, the subpicture stream buffer 600, the audio encoder 700, the audio stream buffer 800, the system encoder 900, a video zone formatter 1300, the Records Department 1200, and a record medium M.

[0020] In this drawing, the bit stream encoded by the encoder of this invention is recorded on an optical disk medium as an example.

[0021] The authoring encoder EC is equipped with the image of an original multimedia title, a subpicture, and the edit information generation section 100 that directs edit of the applicable part of the multimedia bit stream MBS according to a request of the user about voice and that can be outputted as scenario data. The edit information creation section 100 consists of the display section, the loudspeaker section, a keyboard, a CPU, the source stream buffer section, etc. preferably. It connects with the above-mentioned source of an external multimedia stream, and the edit information creation section 100 receives supply of the multimedia source data St1, St3, and St5.

[0022] A user can reproduce an image and voice for multimedia source data using the display section and a loudspeaker, and can recognize the contents of the title. Furthermore, a user inputs the edit directions of the contents in alignment with a desired scenario using the keyboard section, checking the reproduced contents. To all or each of each source data including two or more contents of a title, the contents of edit directions choose the one or more contents of each source data for every predetermined time, and mean information which carries out connection playback of those selected contents by the predetermined approach.

[0023] CPU generates the scenario data St 7 which coded information, such as a location of the part for edit of each stream St1, St3, and St5 of multimedia source data, die length, and a time interrelation between each edit part, based on keyboard entry.

[0024] A source stream buffer is outputted, after it has a predetermined capacity and predetermined carries out time amount Td delay of each streams St1, St3, and St5 of

multimedia source data.

[0025] This is because only this time amount Td needs to delay multimedia source data and needs to synchronize with edit encoding, when encoding to that a user creates the scenario data St 7 and coincidence (i.e., since some time amount Td is taken to determine the contents of edit processing of multimedia source data based on the scenario data St 7 in encoding processing serially so that it may mention later when actually performing edit encoding).

[0026] Since a time delay Td is extent required for synchronizing between each element in a system in such serial edit processing, a source stream buffer usually consists of high-speed record media, such as semiconductor memory.

[0027] However, after completing the scenario data St 7 through the whole title, a time delay Td is 1 title or the time amount need beyond it at the time of the so-called batch edit which encodes multimedia source data at a stretch. In such a case, a source stream buffer can be constituted using low-speed mass record media, such as a video tape, a magnetic disk, and an optical disk. That is, what is necessary is just to constitute a source stream buffer using a suitable storage according to a time delay Td and a manufacturing cost.

[0028] It connects with the edit information creation section 100, and the encoding system control section 200 receives the scenario data St 7 from the edit information creation section 100. The encoding system control section 200 generates the timing signals St9, St11, and St13 of each encoding parameter data for encoding the part for edit of multimedia source data and encoding initiation, and termination based on the information about the time location and die length of the section for edit which are contained in the scenario data St 7, respectively. In addition, as mentioned above, since each multimedia source data St1, St3, and St5 carry out time amount Td delay and are outputted by the source stream buffer, they synchronize with each timing St9, St11, and St13.

[0029] That is, a signal St 9 is a video encoding signal which directs the timing which encodes the video stream St 1, in order to extract the part for encoding from the video stream St 1 and to generate a video encoding unit. Similarly, a signal St 11 is a subpicture stream encoding signal which directs the timing which encodes the subpicture stream St 3, in order to generate a subpicture encoding unit. Moreover, a signal St 13 is an audio encoding signal which directs the timing which encodes the audio stream St 5, in order to generate an audio encoding unit.

[0030] The encoding system control section 200 generates the timing signals St21, St23, and St25 for arranging the encoded multimedia encoding stream so that it may become a predetermined interrelation further based on information, such as a time interrelation between the parts for encoding of each stream St1, St3, and St5 of the multimedia source data contained in the scenario data St 7.

[0031] The encoding system control section 200 is attached per title edit (VOB) of

each title for 1 video zone VZ, and generates the stream encoding data St 33 in which the encoding parameter for system encoding which multiplexes the multimedia encoding stream of the playback hour entry IT and video in which the playback time amount of the title edit unit (VOB) is shown, an audio, and a subpicture (multiplexer) is shown.

[0032] The encoding system control section 200 generates the array indication signal St 39 which specifies the format parameter for formatting it, using as the multimedia bit stream MBS each title edit unit (VOB) for generating connection of the title edit unit (VOB) of each title of the multimedia bit stream MBS, or the interleave title edit unit (VOBs) which superimposes each title edit unit from the title edit unit (VOB) of each stream in a predetermined commutative time relation.

[0033] The video encoder 300 is connected to the source stream buffer of the edit information creation section 100, and the encoding system control section 200, and whether their being an NTSC signal, a PAL signal, or a telecine material and a parameter are inputted as encoding conditions and a class of material, respectively at the time of the encoding parameter data for the video stream St 1 and video encoding and St9 of the timing signal of encoding initiation termination, for example, the initiation termination timing of encoding, a bit rate, and encoding initiation termination. Based on the video encoding signal St 9, the video encoder 300 encodes the predetermined part of the video stream St 1, and generates the video encoding stream St 15.

[0034] Similarly, the subpicture encoder 500 is connected to the source buffer of the edit information creation section 100, and the encoding system control section 200, and the subpicture stream St 3 and the subpicture stream encoding signal St 11 are inputted, respectively. Based on the parameter signal St 11 for subpicture stream encoding, the subpicture encoder 500 encodes the predetermined part of the subpicture stream St 3, and generates the subpicture encoding stream St 17.

[0035] The audio encoder 700 is connected to the source buffer of the edit information creation section 100, and the encoding system control section 200, and the audio stream St 5 and the audio encoding signal St 13 are inputted, respectively. Based on the parameter data for audio encoding, and the signal St 13 of encoding initiation termination timing, the audio encoder 700 encodes the predetermined part of the audio stream St 5, and generates the audio encoding stream St 19.

[0036] The video stream buffer 400 is connected to the video encoder 300, and the video encoding stream St 15 outputted from the video encoder 300 is saved. Further, it connects with the encoding system control section 200, and the video stream buffer 400 outputs the saved video encoding stream St 15 as a video encoding stream St 27 based on the input of timing signal St21 at the time of **.

[0037] Similarly, the subpicture stream buffer 600 is connected to the subpicture encoder 500, and the subpicture encoding stream St 17 outputted from the subpicture

encoder 500 is saved. Further, it connects with the encoding system control section 200, and the subpicture stream buffer 600 outputs the saved subpicture encoding stream St 17 as a subpicture encoding stream St 29 based on the input of timing signal St23 at the time of **.

[0038] Moreover, the audio stream buffer 800 is connected to the audio encoder 700, and the audio encoding stream St 19 outputted from the audio encoder 700 is saved. Further, it connects with the encoding system control section 200, and the audio stream buffer 800 outputs the saved audio encoding stream St 19 as an audio encoding stream St 31 based on the input of timing signal St25 at the time of **.

[0039] The system encoder 900 is connected to the video stream buffer 400, the subpicture stream buffer 600, and the audio stream buffer 800, and the audio encoding St 31 is inputted at the time of the subpicture encoding stream St 29 and ** at the time of the video encoding stream St 27 and ** at the time of **. The system encoder 900 is connected to the encoding system control section 200 again, and the stream encoding data St 33 are inputted.

[0040] Based on the signal St 33 of the encoding parameter data of system encoding, and encoding initiation termination timing, the system encoder 900 performs multiplexing processing to streams St27, St29, and St31 at the time of each **, and generates the title edit unit (VOB) St 35.

[0041] It connects with the system encoder 900 and the title edit unit St 35 is inputted into the video zone formatter 1300. Further, it connects with the encoding system control section 200, and the signal St 39 of timing is inputted into the video zone formatter 1300 the format parameter data for formatting the multimedia bit stream MBS, and always [format open]. The video zone formatter 1300 rearranges the title edit unit St 35 for 1 video zone VZ into the sequence of meeting a user's request scenario, based on the title edit unit St 39, and generates the edited multimedia bit stream St 43.

[0042] The multimedia bit stream St 43 edited into the contents of this user's request scenario is transmitted to the Records Department 1200. The Records Department 1200 processes the edit multimedia bit stream MBS into the data St 43 of a format according to a record medium M, and records on a record medium M. In this case, the volume file structure VFS which shows beforehand the physical address on the medium generated by the video zone formatter 1300 is contained in the multimedia bit stream MBS.

[0043] Moreover, a direct output is carried out to a decoder which describes the encoded multimedia bit stream St 35 below, and you may make it reproduce the edited contents of a title. In this case, it cannot be overemphasized to the multimedia bit stream MBS that the volume file structure VFS is not contained.

[0044] With reference to the authoring decoder DC, next drawing 3 , the multimedia bit stream MBS edited by the authoring encoder EC concerning this invention is decoded,

and 1 operation gestalt of the authoring decoder DC which develops the contents of each title in accordance with the scenario of a request of a user is explained. In addition, in this operation gestalt, the multimedia bit stream St 45 encoded by the authoring encoder EC recorded on the record medium M is recorded on the record medium M.

[0045] The authoring decoder DC consists of the multimedia bit stream playback section 2000, the scenario selection section 2100, the decoding system control section 2300, the stream buffer 2400, the system decoder 2500, a video buffer 2600, the subpicture buffer 2700, the audio buffer 2800, the synchronousr-control section 2900, the video decoder 3800, the subpicture decoder 3100, the audio decoder 3200, the synthetic section 3500, a video-data output terminal 3600, and an audio data output terminal 3700.

[0046] The multimedia bit stream playback section 2000 consists of the record-medium drive unit 2004 which makes a record medium M drive, a read-head unit 2006 which reads the information currently recorded on the record medium M, and generates the binary reading signal St 57, the signal-processing section 2008 which performs various processings to the reading signal ST 57, and generates the playback bit stream St 61, and a device control section 2002. It connects with the decoding system control section 2300, and the device control section 2002 generates the playback control signals St55 and St59 which control the record-medium drive unit (motor) 2004 and the signal-processing section 2008, respectively in response to the multimedia bit stream playback indication signal St 53.

[0047] Decoder DC is equipped with the scenario selection section 2100 which gives directions to the authoring decoder DC and which can be outputted as scenario data so that the part of the request of a user about the image of the multimedia title edited with the authoring encoder EC, a subpicture, and voice may be reproduced, and a corresponding scenario may be chosen and it may reproduce.

[0048] The scenario selection section 2100 consists of a keyboard, a CPU, etc. preferably. Based on the contents of the scenario inputted with the authoring encoder EC, a user operates a desired scenario and inputs the keyboard section. CPU generates scenario select data St51 which directs the selected scenario based on keyboard entry. The scenario selection section 2100 is connected to the decoding system control section 2300 by for example, the infrared communication device etc. The decoding system control section 2300 generates the playback indication signal St 53 which controls actuation of the multimedia bit stream playback section 2000 based on St51.

[0049] The stream buffer 2400 has predetermined buffer capacity, extracts the address information and synchronous initial value data of each stream, and generates stream control data St63 while it saves temporarily the regenerative-signal bit stream St 61 inputted from the multimedia bit stream playback section 2000. It connects with

the decoding system control section 2300, and the stream buffer 2400 supplies generated stream control data St63 to the decoding system control section 2300.

[0050] It connects with the decoding system control section 2300, and reception and the interior carry out the system clock (STC) set of the synchronous initial value data (SCR) contained in the synchronousr-control data St 81, and the synchronousr-control section 2900 supplies the reset system clock St 79 to the decoding system control section 2300.

[0051] Based on a system clock St 79, the decoding system control section 2300 generates the stream read-out signal St 65 at the predetermined spacing, and inputs it into the stream buffer 2400.

[0052] The stream buffer 2400 outputs the playback bit stream St 61 at the predetermined spacing based on the read-out signal St 65.

[0053] The decoding system control section 2300 generates the decoding stream indication signal St 69 which shows ID of each stream of the video corresponding to the selected scenario, a subpicture, and an audio further based on scenario select data St51, and outputs it to the system decoder 2500.

[0054] Based on directions of the decoding indication signal St 69, as a video encoding stream St 71, it outputs to a video buffer 2600 as a subpicture encoding stream St 73, and the system decoder 2500 outputs the video inputted from the stream buffer 2400, a subpicture, and the stream of an audio to the audio buffer 2800 as the subpicture buffer 2700 and an audio encoding stream St 75, respectively.

[0055] The system decoder 2500 detects the playback start time (PTS) and decoding start time (DTS) in each minimum control unit of each stream St 67, and generates the time amount information signal St 77. This time amount information signal St 77 is inputted into the synchronousr-control section 2900 as synchronousr-control data St 81 via the decoding system control section 2300.

[0056] The synchronousr-control section 2900 determines decoding initiation timing which becomes predetermined sequence about each stream as synchronousr-control data St 81 after each decoding. Based on this decoding timing, the synchronousr-control section 2900 generates the video stream decoding start signal St 89, and is the video decoder 3800. It inputs. Similarly, the synchronousr-control section 2900 generates the subpicture decoding start signal St 91 and the audio decoding start signal t93, and inputs them into the subpicture decoder 3100 and the audio decoder 3200, respectively.

[0057] Based on the video stream decoding start signal St 89, the video decoder 3800 generates the video outlet demand signal St 84, and outputs it to a video buffer 2600. A video buffer 2600 outputs the video stream St 83 to the video decoder 3800 in response to the video outlet demand signal St 84. The video decoder 3800 detects the playback hour entry included in the video stream St 83, and when it receives the input of the video stream St 83 of the amount equivalent to playback time amount, it makes

an invalid the video outlet demand signal St 84. Thus, the video stream equivalent to predetermined playback time amount is decoded by the video decoder 3800, and reproduced video signal St104 is outputted to the synthetic section 3500.

[0058] Similarly, based on the subpicture decoding start signal St 91, the subpicture decoder 3100 generates the subpicture output request signal St 86, and supplies it to the subpicture buffer 2700. The subpicture buffer 2700 outputs the subpicture stream St 85 to the subpicture decoder 3100 in response to the subpicture output request signal St 86. The subpicture decoder 3100 decodes the subpicture stream St 85 of the amount equivalent to predetermined playback time amount based on the playback hour entry included in the subpicture stream St 85, reproduces the subpicture signal St 99, and is outputted to the synthetic section 3500.

[0059] The synthetic section 3500 makes video signal St104 and the subpicture signal St 99 superimpose, generates multi-picture video signal St105, and outputs it to the video outlet terminal 3600.

[0060] Based on the audio decoding start signal St 93, the audio decoder 3200 generates the audio output request signal St 88, and supplies it to the audio buffer 2800. The audio buffer 2800 outputs the audio stream St 87 to the audio decoder 3200 in response to the audio output request signal St 88. The audio decoder 3200 decodes the audio stream St 87 of the amount equivalent to predetermined playback time amount based on the playback hour entry included in the audio stream St 87, and outputs it to the audio output terminal 3700.

[0061] Thus, a user's scenario selection can be answered and the multimedia bit stream MBS which a user requests from real time can be reproduced. That is, the authoring decoder DC can reproduce the contents of a title which a user demands by reproducing the multimedia bit stream MBS corresponding to the selected scenario whenever it chooses the scenario with which users differ.

[0062] Real time or the multimedia bit stream which bundles up, encodes and follows the scenario of two or more arbitration is [multimedia source data] generable in order to arrange the substream showing each contents in which two or more branching of the minimum edit unit is possible to a predetermined time correlation to the basic contents of a title in the authoring system of this invention, as stated above.

[0063] Moreover, the multimedia bit stream encoded in this way is reproducible according to the scenario of the arbitration of two or more scenarios. and scenario another even if it is under playback from the selected scenario -- also choosing (changing) -- the multimedia (dynamically) bit stream according to the new selected scenario is reproducible. Moreover, according to the scenario of arbitration, while reproducing the contents of a title, the scene of the arbitration of further two or more scenes can be chosen dynamically, and it can reproduce.

[0064] Thus, in the authoring system in this invention, it can encode and it not only reproduces the multimedia bit stream MBS on real time, but can reproduce repeatedly.

In addition, it is indicated about the detail of an authoring system by the Japan patent application as of September 27, 1996 by the same applicant as this patent application.
[0065] An example of DVD which has a single recording surface in DVD drawing 4 is shown. The DVD record medium RC 1 in this example consists of a wrap protective layer PL 1 the information recording surface RS 1 and this which irradiate laser beam LS and perform a store and read-out of information. Furthermore, the reinforcement layer BL1 is formed in the background of a recording surface RS 1. Thus, let a front face SA and the field by the side of the reinforcement layer BL1 be rear faces SB for the field by the side of a protective layer PL 1. Like this medium RC 1, the DVD medium which has the single recording layer RS 1 is called the one layer disk of one side to one side.
[0066] The detail of the C1 section of drawing 4 is shown in drawing 5 . The recording surface RS 1 is formed of the information layer 4109 which adhered reflective film, such as a metal thin film. A protective layer PL 1 is formed by the 1st transparence substrate 4108 which moreover has the predetermined thickness T1. The reinforcement layer BL1 is formed by the second transparence substrate 4111 which has the predetermined thickness T2. The first and second transparence bases 4108 and 4111 were established between them, and are mutually pasted up by the glue line 4110.
[0067] Furthermore, the printing layer 4112 for label printing is formed on the 2nd transparence substrate 4111 if needed. Only a part required for the display of not all fields but the alphabetic character on the substrate 4111 of the reinforcement layer BL1, or a picture is printed, and the printing layer 4112 is good even if other parts are unreserved in the transparence substrate 4111. In that case, when it sees from a rear-face SB side, in the part which is not printed, the light which the metal thin film 4109 which forms a recording surface RS 1 reflects can be directly seen, for example, when a metal thin film is an aluminum thin film, a background is visible to silver white, and a printer graphic and a graphic form come floating and appear on it. It is not necessary to form the printing layer 4112 all over the reinforcement layer BL1, and it may be partially prepared according to an application.
[0068] The detail of the C2 section of drawing 5 is further shown in drawing 6 . In the front face SA on which light beam LS carries out incidence, and information is taken out, when a concavo-convex pit is formed by forming technique and the field where the 1st transparence substrate 4108 and the information layer 4109 touch changes the die length and spacing of this pit, information is recorded. That is, the pit configuration of the irregularity of the 1st transparence substrate 4108 is imprinted by the information layer 4109. The die length and spacing of this pit become short compared with the case of CD, and the code track and pitch which are formed in a pit train are also constituted narrowly. Consequently, surface recording density is improving sharply.

[0069] Moreover, the front-face SA side in which the pit of the 1st transparence substrate 4108 is not formed serves as a flat field. The 2nd transparence substrate 4111 is an object for reinforcement, and is a transparence substrate with flat both sides which consist of the same quality of the materials as the 1st transparence substrate 4108. And the same, although the predetermined thickness T1 and T2 has [both] 0.6 desirablemm, there is what is limited to it. [no]

[0070] Informational ejection is taken out as reflection factor change of an optical spot by irradiating light beam LS like the case of CD. In a DVD system, since it can be large and a light beam can ** the numerical aperture NA of an objective lens wavelength lambda small, the diameter of the optical spot Ls to be used can be narrowed down to the abbreviation 1/1.6 of the optical spot in CD. This means having one about 1.6 times the resolution of this compared with CD system.

[0071] The optical system which enlarged NA (numerical aperture) of 650nm red semiconductor laser with short wavelength and an objective lens to 0.6mm uses for data read-out from DVD, and it is ******. The information capacity on which having made thickness T of this and a transparence substrate thin to 0.6mm can record an interval at one side of an optical disk with a diameter of 120mm exceeds 5 G bytes.

[0072] Also in the one layer disk RC 1 of one side which has the single recording surface RS 1 as mentioned above, since recordable amount of information is 10 times nearer compared with CD, a DVD system can deal with a dynamic image with the very large data size per unit, without spoiling the image quality. Consequently, even if it sacrifices image quality of a dynamic image in the conventional CD system, compared with playback time amount being 74 minutes, an account rec/play student is possible [in a high-definition dynamic image] in DVD over 2 hours or more. Thus, DVD has the description of being suitable for the record medium of a dynamic image.

[0073] The example of the DVD record medium which has two or more above-mentioned recording surfaces RS in drawing 7 and drawing 8 is shown. The DVD record medium RC 2 of drawing 7 has the first and the second translucent recording surface RS1 and RS2 which were allotted to the bilayer the same side that is, on the side front SA. The record playback from the second page is possible to coincidence by using light beams LS1 and LS2 different, respectively to the first recording surface RS 1 and the second recording surface RS 2. Moreover, you may make it correspond to both the recording surfaces RS1 and RS2 by either light beam LS1 or LS2. Thus, the constituted DVD record medium is called an one side bilayer disk. Although the recording layers RS1 and RS2 of two sheets were allotted in this example, it cannot be overemphasized that the DVD record medium which allotted the recording layer RS of two or more sheets can be constituted if needed. Such a disk is called an one side multilayer disk.

[0074] On the other hand, the DVD record medium RC 3 of drawing 8 is the second recording surface RS 2 and its ************** to the first recording surface RS 1

and Background SB in an opposite side SA, i.e., side front, side. In these examples, although the example in which the bilayer also received the recording surface was shown in DVD of one sheet, it cannot be overemphasized that it can constitute so that it may have a multilayer recording surface more than a bilayer. Like the case of drawing 7 , light beams LS1 and LS2 may be formed according to an individual, and it can also use for record playback of both recording surfaces RS1 and RS2 by one light beam. Thus, the constituted DVD record medium is called the one layer disk of double-sided. Moreover, it cannot be overemphasized that the DVD record medium which allotted the recording layer RS of two or more sheets to one side can be constituted. Such a disk is called a double-sided multilayer disk.

[0075] The top view which looked at the recording surface RS of the DVD record medium RC from the exposure side of light beam LS to drawing 9 and drawing 10 is shown, respectively. The truck TR which records information is spirally established in DVD continuously towards the direction of a periphery from inner circumference. Truck TR is divided into two or more sectors for every predetermined data unit. In addition, in order to make it legible, it is expressed with drawing 9 that it is divided into three or more sectors per 1 round of trucks.

[0076] Usually, Truck TR is wound in the direction DrA of a clockwise rotation towards the endpoint OA of a periphery from the endpoint IA of the inner circumference of Disk RCA, as shown in drawing 9 . Such a disk RCA is called a clockwise rotation disk, and the truck is called the clockwise rotation truck TRA. Moreover, as shown in drawing 10 depending on an application, Truck TRB is wound in the direction DrB of the circumference of a clock towards the endpoint IB of inner circumference from the endpoint alumnus of the periphery of Disk RCB. This direction DrB is called the counterclockwise rotation disk RCB and the counterclockwise rotation truck TRB, in order to distinguish from the disk RCA of drawing 9 since it is the direction of the circumference of an anti-clock if it sees toward a periphery from inner circumference. The above-mentioned truck winding directions DrA and DrB are the motions which scan a truck for record playback of a light beam, i.e., truck pass. The opposite direction RdA of the truck winding direction DrA is a direction which rotates Disk RCA. The opposite direction RdB of the truck winding direction DrB is a direction which rotates Disk RCB.

[0077] The development view of disk RC2o which is an example of the single-sided bilayer disk RC 2 shown in drawing 11 at drawing 7 is shown typically. As the first lower recording surface RS 1 is shown in drawing 9 , the clockwise rotation truck TRA is formed in the direction DrA of a clockwise rotation. As shown in the second upper recording surface RS 2 at drawing 12 , the counterclockwise rotation truck TRB is formed in the direction DrB of a counterclockwise rotation. In this case, the truck periphery edges alumnus and OA by the side of the upper and lower sides are located on the same line parallel to the center line of disk RC2o. Both the winding directions

DrA and DrB of the above-mentioned truck TR are also the directions of the R/W of data to Disk RC. In this case, as for the winding direction of an up-and-down truck, Contrary DrA and DrB, i.e., the truck pass of an up-and-down recording layer, has countered.

[0078] Opposite truck pass type single-sided bilayer disk RC2o When it rotates in the RdA direction corresponding to the first recording surface RS 1, light beam LS traces the truck of the first recording surface RS 1 along with the truck pass DrA and it arrives at the periphery edge OA By adjusting light beam LS so that a focus may be connected to the periphery edge alumnus of the second recording surface RS 2, light beam LS can trace the truck of the second recording surface RS 2 continuously. Thus, the physical distance with the trucks TRA and TRB of the first and the second recording surface RS1 and RS2 is adjusting the focus of light beam LS, and can be canceled momentarily. Consequently, in the single-sided opposite truck pass type bilayer disk RCo, it is easy to process the truck on a vertical bilayer as one continuous truck TR. Therefore, the multimedia bit stream MBS in an authoring system which was described with reference to drawing 1 and which is the maximum management unit of multimedia data is continuously recordable on the recording layers RS1 and RS2 of one bilayer of medium RC2o.

[0079] In addition, if it removes that establish the counterclockwise rotation truck TRB that this example described the winding direction of the truck of recording surfaces RS1 and RS2, and reversely [RS / 1], i.e., the first recording surface, establish the clockwise rotation truck TRA in the second recording surface, and a case changes the hand of cut of a disk into RdB, both recording surfaces will be used like an above-mentioned example as what has one continuous truck TR. Therefore, explanation of the illustration attached to such an example for facilitation is omitted. Thus, the multimedia bit stream MBS of a huge title can be recorded on opposite truck pass type one side bilayer disk RCof one sheet2o by constituting DVD. Such a DVD medium is called an one side bilayer opposite truck pass mold disk.

[0080] The development view of further example RC2p of the single-sided bilayer disk RC 2 shown in drawing 12 at drawing 7 is shown in a ** type. As the first and the second recording surface RS1 and RS2 are shown in drawing 9 , both the clockwise rotation trucks TRA are formed. in this case, single-sided bilayer disk RC2p rotates in the RdA direction -- having -- the migration direction of a light beam -- the winding direction of a truck -- the same -- that is, the truck pass of an up-and-down recording layer is mutually parallel. In this case, even if it sets, the truck periphery edges OA and OA by the side of the upper and lower sides are preferably located on the same line parallel to the center line of disk RC2p. So, in the periphery edge OA, an access place is changeable [from the periphery edge OA of the truck TRA of the first recording surface RS 1 / to the periphery edge OA of the truck TRA of the second recording surface RS 2] by adjusting the focus of light beam LS momentarily like

medium RC2o stated by drawing 11 .
[0081] However, what is necessary is just to carry out reverse (in anti-RdA direction) rotation of the medium RC2p, in order to access the truck TRA of the second recording surface RS 2 continuously in time by light beam LS. However, since it is not efficient to change the hand of cut of a medium according to the location of an optical beam After light beam LS arrives at the truck periphery edge OA of the first recording surface RS 1 as shown by the arrow head all over drawing, a light beam by making it move to the truck inner circumference edge IA of the second recording surface RS 2 Can use as one truck which continued logically, and if required You may record the multimedia bit stream MBS of 1 title at a time on each truck as a respectively different truck, without carrying the truck of an up-and-down recording surface as one continuous truck. Such a DVD medium is called an one side bilayer parallel truck pass mold disk.
[0082] In addition, even if it prepares that this example described the winding direction of the truck of both the recording surfaces RS1 and RS2, and reversely [TRB], i.e., a counterclockwise rotation truck, it is the same if it removes setting the hand of cut of a disk to RdB. This one side bilayer parallel truck pass mold disk fits the application which records two or more titles like an encyclopedia as which random access is required frequently on medium RCof one sheet2p.
[0083] The development view of example RC3s of the DVD medium RC 3 of the one layer mold of double-sided which has respectively much more recording surfaces RS1 and RS2 on one side shown in drawing 13 at drawing 8 is shown. The clockwise rotation truck TRA is formed and, as for one recording surface RS 1, the counterclockwise rotation truck TRB is established in the recording surface RS 2 of another side. In this case, even if it sets, the truck periphery edges OA and alumnus of both recording surfaces are preferably located on the same line parallel to the center line of disk RC3s. As for these recording surfaces RS1 and RS2, although the winding direction of a truck is opposite, truck pass has the relation of the field symmetry mutually. Such disk RC3s is called the one layer symmetry truck pass mold disk of double-sided. One layer symmetry truck pass mold disk RC3s of double-sided [these] is rotated in the RdA direction corresponding to the first record medium RS 1. Consequently, the truck pass of the second record medium RS 2 of the opposite side is a direction opposite to the truck winding direction DrB, i.e., DrA. In this case, it is not practical continuation and for it not to be concerned in discontinuous but to essentially access two recording surfaces RS1 and RS2 by the same light beam LS. So, the multimedia bit stream MSB is recorded on each of the recording surface of a front flesh side.
[0084] The development view of further example RC3a of the one layer DVD medium RC 3 of double-sided shown in drawing 14 at drawing 8 is shown. As shown in drawing 9 , the clockwise rotation truck TRA is established in both the recording surfaces RS1

and RS2 of both. In this case, even if it sets, the truck periphery edges OA and OA by the side of [RS1 and RS2] both recording surfaces are preferably located on the same line parallel to the center line of disk RC3a. However, unlike truck pass mold disk RC3s for one layer of both sides described previously, in this example, the truck on these recording surfaces RS [RS1 and] 2 has an unsymmetrical relation. Such disk RC3a is called the truck pass mold disk for un-[of double-sided / one layer]. Truck pass mold disk RC3s for un-[of double-sided / these / one layer] is rotated in the RdA direction corresponding to the first record medium RS 1.

[0085] Consequently, the truck pass of the second recording surface RS 2 of the opposite side is a direction opposite to the truck winding direction DrA, i.e., the DrB direction. Therefore, if single light beam LS is continuously moved to the periphery from the inner circumference of the first recording surface RS 1, and inner circumference from the periphery of the second recording surface RS 2, even if it will not prepare a different source of a light beam for every recording surface, double-sided record playback is possible, without carrying out front flesh-side reversal of the medium PC3a. Moreover, by the truck pass mold disk for un-[of double-sided / these / one layer], the truck pass of both the recording surfaces RS1 and RS2 is the same. So, even if it does not prepare a source of a light beam which is different for every recording surface by reversing the front flesh side of medium PC3a, double-sided record playback is possible at single light beam LS, consequently equipment can be manufactured economically. In addition, even if it establishes Truck TRB in both the recording surfaces RS1 and RS2 instead of Truck TRA, it is fundamentally [as this example] the same.

[0086] Like ****, redoubling-ization of storage capacity demonstrates the real value by multilayering of a recording surface in the field of the multimedia which reproduces two or more dynamic-image data recorded on the disk of one sheet by the easy DVD system, two or more audio data, two or more graphics data, etc. through dialogue actuation with a user. That is, it makes it possible to offer the quality of the movie which manufactured one movie which was a software provider's dream conventionally by one medium by record to the generation from whom the language area from which a large number differ, and a large number differ as it is.

[0087] The software provider of a movie title had to make, supply and manage the mull CHIREI Ted title about the same title conventionally [parental] as a package according to much global language and individual corresponding to the parental lock regulated in Western countries. This time and effort was very big. Moreover, it is important for this that high definition is also reproducible as it was meant with last thing. The record medium which approaches solution of such a wish 1 step is DVD.

[0088] As a multi-angle type and a typical example of dialogue actuation, while reproducing one scene, the function of the multi-angle type of changing to a scene from another view is demanded. If this is the scene of baseball, it has the demand of

application with which what has a user [like] is referred to as choosing freely as the camera is changed out of some angle types, such as an angle type consisting mainly of the angle type consisting mainly of the pitcher who saw from the backstop side, a catcher, and a batter, the angle type centering on Uchino who saw from the backstop side, the pitcher that saw from the pin center,large side, a catcher, and a batter.

[0089] In DVD, the MPEG same as a method which records signal data, such as a dynamic image, an audio, and graphics, as a video CD is used in order to meet such a demand. With the video CD and DVD, even if it calls it the same MPEG format from the difference of the capacity and transfer rate, and the signal-processing engine performance in a regenerative apparatus, a somewhat different compression method called MPEG1 and MPEG 2 and data format are adopted. However, about the contents of MPEG1 and MPEG 2, and its difference, since the meaning of this invention is not directly related, it omits explanation (for example, refer to MPEG specification document of ISO11172 and ISO13818). It is attached to the DS of the DVD system concerning this invention, and explains later with reference to drawing 16 , drawing 17 , drawing 18 , drawing 19 , and drawing 20 .

[0090] if the title of the contents as each demand is boiled, respectively and is prepared in order to fill the demand of multi-scene above-mentioned parental lock playback and multi-angle-type playback, it has scene data with which mere parts differ -- only the number of demands must prepare the title of the same contents in general, and it must record on a record medium. Since this will repeat and record the same data on the field of most record media, it alienates the use effectiveness of the storage capacity of a record medium remarkably. Furthermore, even if it carries out with a mass record medium like DVD, it is impossible to record the title corresponding to all demands. Although such a problem can be said to be solving if the capacity of a record medium can be increased fundamentally, it is not very desirable from a viewpoint of a deployment of a system resource.

[0091] In the DVD system, it constitutes that the data of the minimum need limit are also about the title which has various variations using the multi-scene control which explains the outline below, and effective use of system resources, such as a record medium, is enabled. That is, the title which has various variations consists of the basic scene section which consists of common data between each title, and the multi-scene section which consists of a different scene group adapted to each demand. And the user enables it to choose the specific scene in each multi-scene section as freedom and at any time at the time of playback. In addition, the multi-scene control including parental lock playback and multi-angle-type playback is explained with reference to drawing 21 later.

[0092] The DS of the authoring data in the DVD system concerning this invention is shown in the data structure diagram 22 of a DVD system. In a DVD system, in order to record the multimedia bit stream MBS, it has the record section divided roughly into

the lead-in groove field LI, the volume field VS, and the lead-out field LO by three.

[0093] The lead-in groove field LI is located in the inner circumference edges IA and IB of the truck in the disk explained to the most-inner-circumference section of an optical disk by drawing 9 and drawing 10 . The data for the stability of operation at the time of read-out initiation of a regenerative apparatus etc. are recorded on the lead-in groove field LI.

[0094] The lead-out field LO is located in the outermost periphery OA and alumnus of an optical disk, i.e., the periphery edges of the truck explained by drawing 9 and drawing 10 . The data in which it is shown that the volume field VS was completed are recorded on this lead-out field LO.

[0095] The volume field VS is located between the lead-in groove field LI and the lead-out field LO, and 2048 bytes of logical sector LS is recorded as an n+1-piece (positive integer in which n contains 0) one-dimensional array. Each logical sector LS is distinguished by the sector number (2 1 0 # # # .. #n). Furthermore, the volume field VS is classified to the volume / file management field VFS formed from m+1 logical sector LS#0 - LS#m (positive integer in which m contains 0 [smaller than n]), and the file data field FDS formed from logical sector LS#m +1 of a n-m individual - LS#n. This file data field FDS is equivalent to the multimedia bit stream MBS shown in drawing 1 .

[0096] Volume / file management field VFS is the file systems for managing the data of the volume field VS as a file, and is formed of logical sector LS#0 to sector several required for receipt of data required for management of an entire disk m (m is the natural number smaller than n) LS#m. According to specification, such as ISO9660 and ISO13346, the information on the file in the file data field FDS is recorded on this volume / file management field VFS.

[0097] The file data field FDS consists of logical sector LS#m +1 of a n-m individual - LS#n, and contains the video manager VMG who has the size of the integral multiple (2048x I and I predetermined integer) of a logical sector, and k video title set VTS#1 - VTS#k (k is the natural number smaller than 100), respectively.

[0098] The video manager VMG has the information showing the volume menu which is a menu for performing a setup and making a change of playback control of an entire volume while holding the information showing the title management information of an entire disk. video title set VTS#k -- ' -- the title which also only serves as a video file from data, such as a call, an animation, an audio, and a still picture, is expressed.

[0099] Drawing 16 shows the internal structure of the video title set VTS of drawing 22 . A video title set VTS is divided roughly into VOBS (VTSTT_VOBS) for VTS titles which are the VTS information (VTSI) showing the management information of an entire disk, and the system stream of a multimedia bit stream. First, after explaining VTS information below, VOBS for VTS titles is explained.

[0100] VTS information mainly contains a VTSI managed table (VTSI_MAT) and a VTSPGC information table (VTS_PGCIT).

[0101] The number of selectable audio streams with which a VTSI managed table is contained in the internal configuration of a video title set VTS and a video title set VTS, the number of subpictures, the storing location of a video title set VTS, etc. are described.

[0102] A VTSPGC information management table is a table which recorded i PGC information VTS_PGCI#1 – VTS_PGCI#I (i is the natural number) showing the program chain (PGC) which controls the order of playback. PGC information VTS_PGCI#I of each entry is the information showing a program chain, and consists of j cel playback information (j is the natural number) C_PBI#1–C_PBI#j. Each cel playback information C_PBI#j includes the playback sequence of a cel, and the control information about playback.

[0103] Moreover, it is the concept which describes the story of a title in the program chain PGC, and a title is formed by describing the order of playback of a cel (after-mentioned). The above-mentioned VTS information is referred by the regenerative apparatus, when in the case of the information about a menu it is stored in the buffer in a regenerative apparatus at the time of playback initiation and the "menu" key of remote control is pressed in the middle of playback, for example, the top menu of #1 is displayed. In the case of a hierarchical menu, it is the main menu as which program chain information VTS_PGCI#1 is displayed by the bottom of a "menu" key press, and the sub menu corresponding to the figure of the "ten key" of remote control in #2 to #9 and #10 or subsequent ones are further constituted like the sub menu of a lower layer. Moreover, for example, it is constituted like the top menu with which #1 is displayed by the bottom of a "menu" key press, and the voice guidance by which #2 or subsequent ones are reproduced corresponding to the figure of a "ten" key.

[0104] Although it is a menu which includes voice guidance although it is a hierarchical menu since the menu itself is expressed by two or more program chains specified as this table, it makes it possible to constitute the menu of the gestalt of arbitration.

[0105] Moreover, for example, in the case of a movie, it is stored in the buffer in a regenerative apparatus at the time of playback initiation, and a regenerative apparatus reproduces a system stream with reference to the cel playback sequence described in PGC.

[0106] The cels said here are all or a part of system streams, and it is used as an access point at the time of playback. For example, in the case of a movie, it can be used as a chapter which has divided the title on the way.

[0107] In addition, each of entered PGC information C_PBI#j contains cel regeneration information and a cel information table. Regeneration information consists of processing information required for playback of cels, such as playback time amount and a count of a repeat. It consists of a block mode (CBM), a cell block type (CBT), a seamless playback flag (SPF), an interleave block location flag (IAF), an STC resetting

flag (STCDF), cel playback time amount (C_PBTM), a seamless angle-type change flag (SACF), a cel head VOBU starting address (C_FVOBU_SA), and a cel termination VOBU starting address (C_LVOBU_SA).

[0108] reproducing multimedia data, such as an image, voice, and a subimage, in a DVD system with the seamless playback said here, without interrupting each data and information -- it is -- detailed -- drawing 23 -- and drawing 24 reference is carried out and it explains later.

[0109] A block mode CBM the cel playback information on each cel that two or more cels show whether one functional block is constituted, and constitute functional block To CBM of the cel playback information which is continuously arranged in PGC information and is arranged at the head The value which shows "the cel of the last of "block in CBM of the value which shows head cel" of a block, and the cel playback information arranged at the last", and the value which shows "the cel within a block" to CBM of the cel playback information arranged in the meantime are shown.

[0110] The cell block type CBT shows the class of block shown by the block mode CBM. For example, in setting up a multi-angle-type function, it sets up as functional block which mentioned above the cel information corresponding to playback of each angle type, and sets up further the value which shows a "angle type" to CBT of the cel playback information on each cel as a class of the block.

[0111] It is the flag which shows whether this cel connects with the cel or cell block reproduced in front seamlessly, and reproduces the seamless playback flag SPF, and in connecting with a front cel or a front cell block seamlessly and reproducing, it sets the flag value 1 to SPF of the cel playback information on this cel. When that is not right, the flag value 0 is set up.

[0112] This cel is the flag which shows whether it is arranged to the interleave field, and the interleave allocation flag IAF sets the flag value 1 to the interleave allocation flag IAF of this cel, when arranged to the interleave field. When that is not right, the flag value 0 is set up.

[0113] The STC resetting flag STCDF is the information on whether it is necessary to reset STC used in case a synchronization is taken at the time of playback of a cel or, and whether there is nothing, and when resetting is required, it sets up the flag value 1. When that is not right, the flag value 0 is set up.

[0114] The seamless angle-type change flag SACF sets the flag value 1 to the seamless angle-type change flag SACF of this cel, when changing seamlessly [this cel belongs to the angle-type section, and]. When that is not right, the flag value 0 is set up.

[0115] Cel playback time amount (C_PBTM) shows the playback time amount of a cel in the frame number precision of video.

[0116] C_LVOBU_SA shows a cel termination VOBU starting address, and the value shows the distance from the logical sector of the head cel of VOBS (VTSTT_VOBS)

for VTS titles with the number of sectors. C_FVOBU_SA shows distance for the cel head VOBU starting address with the number of sectors from the logical sector of the head cel of an example and VOBS (VTSTT_VOBS) for VTS titles.

[0117] Next, it attaches and explains to VOBS for VTS titles, i.e., 1 multi-media-system stream data VTSTT_VOBS. System stream data VTSTT_VOBS consists of i system streams (i is the natural number) SS called the video object VOB. Each video object VOB#1-VOB#i consists of at least one video data, and depending on the case, even a maximum of eight audio data and the subimage data of a maximum of 32 are interleaved, and it is constituted.

[0118] Each video object VOB consists of q cels (q is the natural number) C#1 - C#q. Each cel C is formed from r video object unit VOBU#1 (r is the natural number) - VOBU#r.

[0119] Two or more GOP(s) which are the refresh periods of video encoding reach, and each VOBU consists of the audio and subpicture of time amount equivalent to it. Moreover, at the head of each VOBU, the nub pack NV which is the management information of this VOBU is included. About the configuration of the nub pack NV, it mentions later with reference to drawing 19 .

[0120] The internal structure of the video zone VZ (drawing 22) is shown in drawing 17 . In this drawing, the video encoding stream St 15 is the video-data train of the compressed single dimension encoded by the video encoder 300. It is the audio data stream of the single dimension with which each data of the right and left of a stereo by which the audio encoding stream St 19 was similarly encoded with the audio encoder 700 was compressed and unified. Moreover, multi-channel, such as surround, is sufficient as audio data.

[0121] The system stream St 35 has the structure where the pack which has a byte count equivalent to logical sector LS#n which was explained by drawing 22 , and which has the capacity of 2048 bytes was arranged by the single dimension. The stream management pack which is called the navigation pack NV and which recorded management information, such as a data array in a system stream, is arranged in the head of the system stream St 35, i.e., the head of VOBU.

[0122] The video encoding stream St 15 and the audio encoding stream St 19 are packet-ized for every byte count corresponding to the pack of a system stream, respectively. These packets are expressed as V1, V2, V3, V4, .. and A1 and A2, and .. all over drawing. These packets are interleaved by suitable sequence as a system stream St 35 in drawing in consideration of the processing time of the decoder for video and audio each data decompression, and the buffer size of a decoder, and arrange a packet. For example, in this example, it is arranged in order of V1, V2, A1, V3, V4, and A2.

[0123] Drawing 17 shows the example by which one dynamic-image data and one audio data were interleaved. However, in a DVD system, record playback capacity is

expanded sharply. The result by which high-speed record playback was realized and improvement in the engine performance of LSI for signal processing was achieved, The subimage data which are two or more audio data and two or more graphics data to one dynamic-image data It is recorded with the gestalt interleaved as one MPEG system stream, and it becomes possible to perform alternative playback from two or more audio data and two or more subimage data at the time of playback. The structure of the system stream used for drawing 18 by such DVD system is expressed.
[0124] Also in drawing 18 , the packet-ized video encoding stream St 15 is expressed as V1, V2, V3, V4, and ... like drawing 17 . However, in this example, there is no audio encoding stream St 19 one, and the audio data stream of St19A, St19B and St19C, and three trains is inputted as the source. Furthermore, the data of St17A and St17B, and two trains are inputted for the subpicture encoding stream St 17 which is a subimage data stream as the source. The compressed data train of these a total of six trains is interleaved by one system stream St 35.
[0125] The video data is encoded by the MPEG method, it has become the unit of compression of the unit of GOP, and, in the case of NTSC, a GOP unit constitutes 1GOP from 15 frames standardly, but the frame number has adjustable. The spacing will also be changed if the frame number in which the stream management pack showing the data with information, such as interleaved relation between data, for management will also be interleaved, and constitutes GOP from spacing which makes a unit GOP on the basis of a video data changes. With DVD, the boundary makes the spacing the GOP unit as within the limits of 0.4 to 1.0 seconds by playback time amount length. If the playback time amount of two or more continuous GOP(s) is 1 or less second, the data pack for management will be interleaved in one stream to the video data of the plurality GOP.
[0126] With DVD, a video object unit (it calls Following VOBU), a call, and one continuous playback unit that can generally be defined as one scene will be constituted [pack / the nub pack NV, and from a call and this nub pack NV to / in front of the following nub pack NV] from a video object, a call (it calls Following VOB), and one or more VOBU(s) in such an administrative data pack. Moreover, VOB calls the data aggregate which gathered a VOB set (it calls Following VOBS). These are the data format adopted for the first time in DVD.
[0127] Thus, when multiple-data-stream is interleaved, the navigation pack NV showing the data for management in which the interleaved relation between data is shown also needs to be interleaved in the unit called the predetermined number unit of packs. GOP is the unit which gathered the video data for about 0.5 seconds which is usually equivalent to the playback time amount of 12 to 15 frames, and is considered that one stream management packet is interleaved by the number of data packets which playback of this time amount takes.
[0128] Drawing 19 is the explanatory view showing the stream management

information which constitutes a system stream, and which is contained in the pack of the interleaved video data, audio data, and subimage data. As shown in this drawing, each data in a system stream is recorded in packet-izing based on MPEG 2, and the pack-ized format. Video, an audio, and the subimage data of the structure of a packet are fundamentally the same. In a DVD system, like the above-mentioned, one pack has the capacity of 2048 bytes and consists of the pack header PKH, a packet header PTH, and a data area including one packet called a PES packet.

[0129] Into the pack header PKH, SCR which shows the criteria time information for the time of day when the pack should be transmitted to the system decoder 2500 from the stream buffer 2400 in drawing 26 , i.e., AV synchronous playback, is recorded. In MPEG, although it assumes making this SCR into the reference clock of the whole decoder, since it is good, in the case of disk media, such as DVD, the clock which serves as criteria of the time of day of the whole decoder separately has been formed by the time of day control closed in each player. Moreover, it is placed, when PTS and DTS on which PTS which shows the time of day which should be outputted as a playback output, DTS which shows the time of day when a video stream should be decoded are recorded have in a packet the head of the access unit which is a decoding unit in a packet header PTH after the video data or the audio data contained in the packet is decoded, and PTS shows the display start time of an access unit, and DTS shows the decoding start time of an access unit. Moreover, DTS is omitted when PTS and DTS are these time of day.

[0130] Furthermore, the stream ID which is the field of 8 bit length which shows whether it is a video packet showing a video-data train, it is a private packet, or it is an MPEG audio packet is contained in the packet header PTH.

[0131] Here, a private packet is data which may define the contents freely on the specification of MPEG 2, with this operation gestalt, audio data (except an MPEG audio) and subimage data are conveyed using the private packet 1, and the PCI packet and the DSI packet are conveyed using the private packet 2.

[0132] The private packet 1 and the private packet 2 consist of a packet header, a private data field, and a data area. In a private data field, the substream ID which has the field of 8 bit length which shows whether the data currently recorded are audio data or it is subimage data is contained. The audio data defined by the private packet 2 can set up a maximum of eight kinds to #0-#7 about a linear PCM system and each AC-3 method. Moreover, subimage data can set up a maximum of 32 kinds to #0-#31.

[0133] In the case of a video data, a data area is the field where the graphics data into which it was compressed [in the case of the compressed data of an MPEG 2 format and audio data] by run length coding in the case of the data of a linear PCM system, an AC-3 method, or an MPEG method and subimage data is recorded.

[0134] Moreover, as for an MPEG 2 video data, a fixed bit rate method (it is described also as "CBR" below) and a Variable Bit Rate method (it is described also as "VBR"

below) exist as the compression approach. A fixed bit rate method is a method with which a video stream is continuously inputted into a video buffer at a fixed rate. On the other hand, a Variable Bit Rate method is a method with which a video stream carries out an intermission and is inputted into a video buffer (intermittently), and it is possible for this to suppress generating of the unnecessary amount of signs.

[0135] In DVD, a fixed bit rate method and a Variable Bit Rate method can be used. In MPEG, since dynamic-image data are compressed by the variable-length-coding method, its amount of data of GOP is not fixed. The decoding time amount of a dynamic image and an audio differs, and the time relation of the time relation of the dynamic-image data read from the optical disk and audio data, the dynamic-image data outputted from a decoder, and audio data stops furthermore, being in agreement. For this reason, for a while, although the approach of taking the time synchronization of a dynamic image and an audio is later explained in full detail with reference to drawing 26 , since it is simple, it explains based on a fixed bit rate method.

[0136] The structure of the nub pack NV is shown in drawing 20 . The nub pack NV consisted of a PCI packet and a DSI packet, and has formed the pack header PKH in the head. SCR which shows the criteria time information for the time of day when the pack should be transmitted to the system decoder 2500 from the stream buffer 2400 in drawing 26 , i.e., AV synchronous playback, is recorded on PKH as mentioned above.

[0137] The PCI packet has PCI information (PCI_GI) and un-seamless multi-angle-type information (NSML_AGLI). Head video frame display time of day (VOBU_S_PTM) and the last video frame display time of day of a video data which are contained in PCI information (PCI_GI) at this VOBU (VOBU_E_PTM) System clock precision (90kHz) describes.

[0138] To un-seamless multi-angle-type information (NSML_AGLI), the read-out starting address at the time of changing an angle type is described as the number of sectors from a VOB head. In this case, since the number of angle types is nine or less, it has an address description field for nine angle types (NSML_AGL_C1_DSTA-NSML_AGL_C9_DSTA) as a field.

[0139] In the DSI packet, it has DSI information (DSI_GI), seamless playback information (SML_PBI), and seamless multi-angle-type playback information (SML_AGLI). The last pack address (VOBU_EA) in this VOBU is described as the number of sectors from a VOBU head as DSI information (DSI_GI).

[0140] Although later mentioned about seamless playback, in order to reproduce seamlessly the title branched or combined, it is necessary to interleave on system stream level by setting a continuation read-out unit to ILVU (multiplexing). The section when interleave processing of two or more system streams is carried out by making ILVU into a smallest unit is defined as an interleave block.

[0141] Thus, in order to reproduce seamlessly the stream interleaved considering ILVU as a smallest unit, seamless playback information (SML_PBI) is described. To

seamless playback information (SML_PBI), this VOBU describes the interleave unit flag (ILVU flag) which shows whether it is an interleave block. It is shown whether this flag exists in the (after-mentioned) to an interleave field, and "1" is set up when it exists in an interleave field. When that is not right, the flag value 0 is set up.

[0142] Moreover, when this VOBU exists in an interleave field, this VOBU describes the unit-end flag which shows whether it is the last VOBU of ILVU. Since ILVU is a continuation read-out unit, if VOBU read now is VOBU of the last of ILVU, it will set up "1." When that is not right, the flag value 0 is set up.

[0143] The ILVU last pack address which shows the address of the last pack of ILVU with which this VOBU belongs when this VOBU exists in an interleave field (ILVU_EA) It describes. The number of sectors from NV of this VOBU describes as the address here.

[0144] Moreover, when this VOBU exists in an interleave field, the starting address (NT_ILVU_SA) of the next ILVU is described. The number of sectors from NV of this VOBU describes as the address here.

[0145] Moreover, when connecting two system streams seamlessly and the audio connection before and after connection is not continuing especially, in order to take the video after connection, and the synchronization of an audio (when it is a different audio etc.), it is necessary to halt an audio (pause). For example, in the case of NTSC, the frame periods of video are about 33.33 msec(s), and the frame periods of an audio AC 3 are 32msec(s).

[0146] For this reason, the audio playback stopping time 1 (VOBU_A_STP_PTM1) which shows the time amount and period information that an audio is stopped, the audio playback stopping time 2 (VOBU_A_STP_PTM2), the audio playback halt period 1 (VOB_A_GAP_LEN1), and the audio playback halt period 2 (VOB_A_GAP_LEN2) are described. This hour entry is described by system clock precision (90kHz).

[0147] Moreover, seamless multi-angle-type playback information (SML_AGLI) It carries out and the read-out starting address at the time of changing an angle type is described. This field is the effective field in the case of a seamless multi-angle type. This address is described by the number of sectors from NV of this VOBU. Moreover, since it is nine or less, the number of angle types is an address description field for nine angle types as a field. : (SML_AGL_C1_DSTA - SML_AGL_C9_DSTA) It has.

[0148] One operation gestalt of the authoring encoder ECD at the time of applying the multimedia bit stream authoring system which starts this invention at DVD encoder drawing 25 to an above-mentioned DVD system is shown. The authoring encoder ECD (a DVD encoder is called henceforth) applied to the DVD system has composition very similar to the authoring encoder EC shown in drawing 2 . Fundamentally, the DVD authoring encoder ECD has the structure which changed the video zone formatter 1300 of the authoring encoder EC for the VOB buffer 1000 and the formatter 1100. Needless to say, the bit stream encoded by the encoder of this invention is recorded

on the DVD medium M. Below, it explains, comparing actuation of the DVD authoring encoder ECD with the authoring encoder EC.

[0149] Also in the DVD authoring encoder ECD, like the authoring encoder EC, the encoding system control section 200 generates each control signals St9, St11, St13, St21, St23, St25, St33, and St39, and controls the video encoder 300, the subpicture encoder 500, and the audio encoder 700 based on the scenario data St 7 showing a user's contents of edit directions inputted from the edit information creation section 100. In addition, the one or more contents of each source data are chosen for every predetermined time to all or each of each source data including two or more contents of a title like the contents of edit directions in the authoring system explained to be the contents of edit directions in a DVD system with reference to drawing 25 , and the information of further the following is included for information which carries out connection playback of those selected contents by the predetermined approach with ****. That is, information, such as a change connection method between the scenes in the multi-angle-type section when it was set up whether a multi-title source stream is chosen from two or more streams, such as data, such as the number of streams contained in the edit unit divided for every predetermined time basis, the number of audios in each stream, the number of subpictures, and its display period, parental one, or a multi-angle type, is included.

[0150] In a DVD system in addition, to the scenario data St 7 The contents of control in a VOB unit required in order to encode a media source stream, That is, [whether it is generation of the mull CHIREI Ted title which enables / whether it is a multi-angle type and / parental control, and] The contents of whether to make seamless connection with the bit rate at the time of encoding of each stream in consideration of the multi-angle type mentioned later, or the interleave in parental control and disk capacity, the start time of each control and end time, and the stream of order are included. The encoding system control section 200 extracts information from the scenario data St 7, and generates an encoding information table and an encoding parameter required for encoding control. An encoding information table and an encoding parameter are later explained in full detail with reference to drawing 27 , drawing 28 , and drawing 29 .

[0151] With the application of above-mentioned information, VOB creation information is included in a DVD system at the signal St 33 of system SUTORIMUEN code parameter data and system encoding initiation termination timing. As VOB creation information, there are time information (VPTS) which starts the connection conditions of order, the number of audios, the encoding information on an audio, Audio ID, the number of subpictures, the subpicture ID, and video presentation, time information (APTS) which starts audio playback. Furthermore, the signal St 39 of the format parameter data of the multimedia tail bit stream MBS and format initiation termination timing includes playback control information and interleave information.

[0152] Based on the encoding parameter signal for video encoding, and the signal St 9 of encoding initiation termination timing, the video encoder 300 encodes the predetermined part of the video stream St 1, and generates the elementary stream according to the MPEG 2 video specification specified to ISO13818. And it outputs to the video stream buffer 400 by making this elementary stream into the video encoding stream St 15.

[0153] Although the elementary stream which applies to the MPEG 2 video specification specified to ISO13818 in the video encoder 300 here is generated To the signal St 9 containing video encoding parameter data at a radical as an encoding parameter At the time of encoding initiation termination timing, a bit rate, and encoding initiation termination, as encoding conditions and a class of material A setup in whether they are an NTSC signal, a PAL signal, or a telecine material, a parameter and Opening GOP, or the encoding mode of closed GOP is inputted as an encoding parameter, respectively.

[0154] The coding method of MPEG 2 is coding which uses inter-frame correlation fundamentally. That is, it encodes with reference to the frame before and behind the frame for coding. However, the frame (intra frame) which does not refer to other frames is inserted in respect of the access nature from the error propagation and stream middle. this intra -- the coding batch which has at least one frame for a frame is called GOP.

[0155] GOP which coding has closed within this GOP completely in this GOP -- closed one -- it is GOP, and this GOP is called Opening GOP when the frame which refers to the frame in front GOP exists in this GOP. therefore, closed one -- when reproducing GOP, it can reproduce only by this GOP, but to reproduce Opening GOP, generally GOP in front of one is required.

[0156] Moreover, the unit of GOP is used as an access unit in many cases. For example, the playback start point in the case of reproducing from the middle of a title and an image change, and high-speed playback is realized by [which is a coding frame in a frame in GOP] being and reproducing only a frame per GOP at the time of special playback of a point or a rapid traverse.

[0157] Based on the subpicture stream encoding signal St 11, the subpicture encoder 500 encodes the predetermined part of the subpicture stream St 3, and generates the variable-length coded data of bit map data. And it outputs to the subpicture stream buffer 600 by making this variable-length coded data into the subpicture encoding stream St 17.

[0158] Based on the audio encoding signal St 13, the audio encoder 700 encodes the predetermined part of the audio stream St 5, and generates audio encoding data. There are data based on the MPEG 2 audio specification specified to the MPEG1 audio specification and ISO13818 which are specified to ISO11172 as this audio encoding data, AC-3 audio data, PCM (LPCM) data, etc. The approach and equipment

which encode these audio data are well-known.
[0159] The video stream buffer 400 is connected to the video encoder 300, and the video encoding stream St 15 outputted from the video encoder 300 is saved. Further, it connects with the encoding system control section 200, and the video stream buffer 400 outputs the saved video encoding stream St 15 as a video encoding stream St 27 based on the input of timing signal St21 at the time of **.
[0160] Similarly, the subpicture stream buffer 600 is connected to the subpicture encoder 500, and the subpicture encoding stream St 17 outputted from the subpicture encoder 500 is saved. Further, it connects with the encoding system control section 200, and the subpicture stream buffer 600 outputs the saved subpicture encoding stream St 17 as a subpicture encoding stream St 29 based on the input of timing signal St23 at the time of **.
[0161] Moreover, the audio stream buffer 800 is connected to the audio encoder 700, and the audio encoding stream St 19 outputted from the audio encoder 700 is saved. Further, it connects with the encoding system control section 200, and the audio stream buffer 800 outputs the saved audio encoding stream St 19 as an audio encoding stream St 31 based on the input of timing signal St25 at the time of **.
[0162] The system encoder 900 is connected to the video stream buffer 400, the subpicture stream buffer 600, and the audio stream buffer 800, and the audio encoding St 31 is inputted at the time of the subpicture encoding stream St 29 and ** at the time of the video encoding stream St 27 and ** at the time of **. The system encoder 900 is connected to the encoding system control section 200 again, and St33 containing the encoding parameter data for system encoding is inputted.
[0163] Based on encoding parameter data and encoding initiation termination timing signal St33, the system encoder 900 performs multiplexing (multiplexer) processing to streams St27, St29, and St31 at the time of each **, and generates the minimum title edit unit (VOBs) St 35.
[0164] The VOB buffer 1000 is a buffer area which carries out the temporary storage of the VOB generated in the system encoder 900, in a formatter 1100, reads required VOB from the VOB buffer 1100 according to St39 at the time of **, and generates 1 video zone VZ. Moreover, a file system (VFS) is added in this formatter 1100, and St43 is generated.
[0165] The stream St 43 edited into the contents of this user's request scenario is transmitted to the Records Department 1200. The Records Department 1200 processes the edit multimedia bit stream MBS into the data St 43 of a format according to a record medium M, and records on a record medium M.
[0166] One operation gestalt of the authoring decoder DC at the time of applying the multimedia bit stream authoring system concerning this invention to an above-mentioned DVD system with reference to drawing 26 is shown in a DVD decoder. With the DVD encoder ECD concerning this invention, the authoring encoder

DCD (a DVD decoder is called henceforth) applied to the DVD system decodes the edited multimedia bit stream MBS, and develops the contents of each title in accordance with the scenario of a request of a user. In addition, in this operation gestalt, the multimedia bit stream St 45 encoded by the DVD encoder ECD is recorded on the record medium M.

[0167] While the fundamental configuration of the DVD authoring decoder DCD is the same as that of the authoring decoder DC shown in drawing 3 and the video decoder 3800 replaces the video decoder 3801, the reorder buffer 3300 and the switcher 3400 are inserted between the video decoder 3801 and the synthetic section 3500. In addition, it connected with the synchronousr-control section 2900, and the switcher 3400 has received the input of the change indication signal St 103.

[0168] The DVD authoring decoder DCD The multimedia bit stream playback section 2000, the scenario selection section 2100, the decoding system control section 2300, the stream buffer 2400, the system decoder 2500, a video buffer 2600, the subpicture buffer 2700, the audio buffer 2800, The synchronousr-control section 2900, the video decoder 3801, It consists of the reorder buffer 3300, the subpicture decoder 3100, the audio decoder 3200, a selector 3400, the synthetic section 3500, a video-data output terminal 3600, and an audio data output terminal 3700.

[0169] The multimedia bit stream playback section 2000 consists of the record-medium drive unit 2004 which makes a record medium M drive, a read-head unit 2006 which reads the information currently recorded on the record medium M, and generates the binary reading signal St 57, the signal-processing section 2008 which performs various processings to the reading signal ST 57, and generates the playback bit stream St 61, and a device control section 2002. It connects with the decoding system control section 2300, and the device control section 2002 generates the playback control signals St55 and St59 which control the record-medium drive unit (motor) 2004 and the signal-processing section 2008, respectively in response to the multimedia bit stream playback indication signal St 53.

[0170] Decoder DC is equipped with the scenario selection section 2100 which gives directions to the authoring decoder DC and which can be outputted as scenario data so that the part of the request of a user about the image of the multimedia title edited with the authoring encoder EC, a subpicture, and voice may be reproduced, and a corresponding scenario may be chosen and it may reproduce.

[0171] The scenario selection section 2100 consists of a keyboard, a CPU, etc. preferably. Based on the contents of the scenario inputted with the authoring encoder EC, a user operates a desired scenario and inputs the keyboard section. CPU generates scenario select data St51 which directs the selected scenario based on keyboard entry. An infrared communication device etc. connects with the decoding system control section 2300, and the scenario selection section 2100 inputs the generated scenario selection signal St 51 into the decoding system control section

2300 with it.

[0172] The stream buffer 2400 has predetermined buffer capacity, extracts the synchronous initial value data (SCR) which exist in the volume file structure VFS and each pack, and the VOBU control information (DSI) which recognizes NABUPAKKU NV existence, and generates stream control data St63 while it saves temporarily the regenerative-signal bit stream St 61 inputted from the multimedia bit stream playback section 2000.

[0173] The decoding system control section 2300 generates the playback indication signal St 53 which controls actuation of the multimedia bit stream playback section 2000 based on scenario select data St51 generated in the decoding system control section 2300. Further, the decoding system control section 2300 extracts a user's playback directions information from the scenario data St 53, and generates a decoding information table required for decoded control. A decoding information table is later explained in full detail with reference to drawing 62 and drawing 63 . Furthermore, the decoding system control section 2300 extracts the title information recorded on optical disk M, such as the video manager VMG, the VTS information VTSI, PGC information C_PBI#j, and cel playback time amount (C_PBTM:Cell Playback time), from the file data field FDS information in the in-stream playback data St 63, and generates the title information St 200.

[0174] Stream control data St63 is generated by the pack unit in drawing 19 . It connects with the decoding system control section 2300, and the stream buffer 2400 supplies generated stream control data St63 to the decoding system control section 2300.

[0175] It connects with the decoding system control section 2300, and reception and the interior carry out the system clock (STC) set of the synchronous initial value data (SCR) contained in the synchronous playback data St 81, and the synchronousr-control section 2900 supplies the reset system clock St 79 to the decoding system control section 2300.

[0176] Based on a system clock St 79, the decoding system control section 2300 generates the stream read-out signal St 65 at the predetermined spacing, and inputs it into the stream buffer 2400. The read-out unit in this case is a pack.

[0177] Next, the generation method of the stream read-out signal St 65 is explained. In the decoding system control section 2300, the system clock St 79 from SCR and the synchronousr-control section 2900 in the stream control data extracted from the stream buffer 2400 is compared, when a system clock St 79 becomes large rather than SCR in St63, it reads, and the demand signal St 65 is generated. A pack transfer is controlled by performing such control per pack.

[0178] The decoding system control section 2300 generates the decoding stream indication signal St 69 which shows ID of each stream of the video corresponding to the selected scenario, a subpicture, and an audio further based on scenario select

data St51, and outputs it to the system decoder 2500.

[0179] ID is given to each when two or more subpicture data, such as titles according to language, such as two or more audio data, such as an audio according to language, such as Japanese, English, and French, and a Japanese title, an English title, and a French title, exist in a title. That is, as explained with reference to drawing 19 , Stream ID is given to a video data and MPEG audio data, and Substream ID is given to subpicture data, the audio data of AC3 method, Linear PCM, and nub pack NV information. Although a user is not conscious of ID, it chooses of which language an audio or a title is chosen in the scenario selection section 2100. If an English audio is chosen, ID corresponding to an English audio will be conveyed by the day code system control section 2300 as scenario select data St51. Furthermore, the decoding system control section 2300 conveys and passes the ID to the system decoder 2500 on St69.

[0180] Based on directions of the decoding indication signal St 69, as a video encoding stream St 71, it outputs to a video buffer 2600 as a subpicture encoding stream St 73, and the system decoder 2500 outputs the video inputted from the stream buffer 2400, a subpicture, and the stream of an audio to the audio buffer 2800 as the subpicture buffer 2700 and an audio encoding stream St 75, respectively. That is, the system decoder 2500 transmits this pack to each buffer (a video buffer 2600, the subpicture buffer 2700, audio buffer 2800), when ID of a stream inputted from the scenario selection section 2100 and ID of the pack transmitted from the stream buffer 2400 are in agreement.

[0181] The system decoder 2500 detects the playback start time (PTS) and playback end time (DTS) in each minimum control unit of each stream St 67, and generates the time amount information signal St 77. This time amount information signal St 77 is inputted into the synchronousr-control section 2900 as St81 via the decoding system control section 2300.

[0182] The synchronousr-control section 2900 determines decoding initiation timing which becomes predetermined sequence about each stream after each decoding based on this time amount information signal St 81. Based on this decoding timing, the synchronousr-control section 2900 generates the video stream decoding start signal St 89, and inputs it into the video decoder 3801. Similarly, the synchronousr-control section 2900 generates the subpicture decoding start signal St 91 and the audio encoding start signal St 93, and inputs them into the subpicture decoder 3100 and the audio decoder 3200, respectively.

[0183] Based on the video stream decoding start signal St 89, the video decoder 3801 generates the video outlet demand signal St 84, and outputs it to a video buffer 2600. A video buffer 2600 outputs the video stream St 83 to the video decoder 3801 in response to the video outlet demand signal St 84. The video decoder 3801 detects the playback hour entry included in the video stream St 83, and when it receives the input of the video stream St 83 of the amount equivalent to playback time amount, it makes

an invalid the video outlet demand signal St 84. Thus, the video stream equivalent to predetermined playback time amount is decoded by the video decoder 3801, and reproduced video signal St95 is outputted to the reorder buffer 3300 and a switcher 3400.

[0184] Since a video encoding stream is coding using inter-frame correlation, when it sees per frame, the order of a display and its order of a coding stream do not correspond. Therefore, it cannot necessarily display in order of decoding. Therefore, the frame which ended decoding is stored in the reorder buffer 3300 temporarily. St103 is controlled and the output St 95 of the video decoder 3801 and the output of the reorder buffer St 97 are changed so that it may become the order of a display in the synchronousr-control section 2900, and it outputs to the synthetic section 3500.

[0185] Similarly, based on the subpicture decoding start signal St 91, the subpicture decoder 3100 generates the subpicture output request signal St 86, and supplies it to the subpicture buffer 2700. The subpicture buffer 2700 outputs the subpicture stream St 85 to the subpicture decoder 3100 in response to the video outlet demand signal St 84. The subpicture decoder 3100 decodes the subpicture stream St 85 of the amount equivalent to predetermined playback time amount based on the playback hour entry included in the subpicture stream St 85, reproduces the subpicture signal St 99, and outputs it to the synthetic section 3500.

[0186] The synthetic section 3500 makes the output of a selector 3400, and the subpicture signal St 99 superimpose, generates a video signal St 105, and outputs it to the video outlet terminal 3600.

[0187] Based on the audio decoding start signal St 93, the audio decoder 3200 generates the audio output request signal St 88, and supplies it to the audio buffer 2800. The audio buffer 2800 outputs the audio stream St 87 to the audio decoder 3200 in response to the audio output request signal St 88. The audio decoder 3200 decodes the audio stream St 87 of the amount equivalent to predetermined playback time amount based on the playback hour entry included in the audio stream St 87, and outputs it to the audio output terminal 3700.

[0188] Thus, a user's scenario selection can be answered and the multimedia bit stream MBS which a user requests from real time can be reproduced. That is, the authoring decoder DCD can reproduce the contents of a title which a user demands by reproducing the multimedia bit stream MBS corresponding to the selected scenario whenever it chooses the scenario with which users differ.

[0189] In addition, the decoding system control section 2300 may supply the title information signal St 200 to the scenario selection section 2100 via the above-mentioned infrared communication device etc. The scenario selection section 2100 enables scenario selection by the interactive user by extracting the title information recorded on optical disk M from the file data field FDS information in the in-stream playback data St 63 contained in the title information signal St 200, and

displaying on a built-in display.

[0190] Moreover, since it differs functionally, the stream buffer 2400, the video buffer 2600, the subpicture buffer 2700, the audio buffer 2800, and the reorder buffer 3300 are expressed with the above-mentioned example as a respectively different buffer. However, one buffer memory can be operated as a buffer according to these individuals by using the buffer memory which has the read in demanded in these buffers, and a rate several times the working speed of read-out by time sharing.

[0191] The concept of the multi-scene control in this invention is explained using multi-scene drawing 21 . As mentioned above, it already consists of the basic scene section which consists of common data between each title, and the multi-scene section which consists of a different scene group adapted to each demand. In this drawing, a scene 1, a scene 5, and a scene 8 are common scenes. The angle-type scene between the common scene 1 and a scene 5 and the parental scene between the common scene 5 and a scene 8 are the multi-scene sections. a different angle type 1 in the multi-angle-type section, i.e., an angle type, an angle type 2, and an angle type 3 -- since -- selection playback can be carried out dynamically [be / they / any of the photoed scene] during playback. In the parental section, selection playback can be carried out beforehand statically [be / they / any of the scene 6 corresponding to the data of different contents, and a scene 7].

[0192] A user inputs the contents of a scenario whether to choose which scene of such the multi-scene section, and to reproduce, in the scenario selection section 2100, and generates them as scenario select data St51. It means reproducing the scene 6 which chose the angle-type scene of arbitration freely in the scenario 1, and was beforehand chosen all over drawing in the parental section. Similarly, in the angle-type section, a scene can be chosen freely and it expresses that the scene 7 is chosen beforehand with the scenario 2 in the parental section.

[0193] Below, the multi-scene shown by drawing 21 is explained with reference to drawing 30 and drawing 31 about PGC information VTS_PGCI at the time of using the DS of DVD.

[0194] The case where the VTSI DS showing the internal structure of the video title set within the DVD DS of drawing 16 describes the scenario of the user directions shown in drawing 21 is shown in drawing 30 . In drawing, the scenario 1 of drawing 21 and a scenario 2 are described as VTS_PGCI#2 to be 2 ** program chain VTS_PGCI#1 in program chain information VTS_PGCIT in VTSI of drawing 16 . That is, VTS_PGCI#1 which describes a scenario 1 consists of cel playback information C_PBI#1 equivalent to a scene 1, cel playback information C_PBI#2 in the multi-angle-type cell block equivalent to a multi-angle-type scene, cel playback information C_PBI#3, cel playback information C_PBI#4, cel playback information C_PBI#5 equivalent to a scene 5, cel playback information C_PBI#6 equivalent to a scene 6, and C_PBI#7 equivalent to a scene 8.

[0195] Moreover, VTS_PGC#2 which describe a scenario 2 consist of cel playback information C_PBI#1 equivalent to a scene 1, cel playback information C_PBI#2 in the multi-angle-type cell block equivalent to a multi-angle-type scene, cel playback information C_PBI#3, cel playback information C_PBI#4, cel playback information C_PBI#5 equivalent to a scene 5, cel playback information C_PBI#6 equivalent to a scene 7, and C_PBI#7 equivalent to a scene 8. In DVD DS, the scene which is the unit of one playback control of a scenario was transposed to the unit on the DVD DS of a cel, and was described, and the scenario which a user directs is realized on DVD.
[0196] The case where VOB DS VTSTT_VOBS which is a multimedia bit stream for the video title sets within the DVD DS of drawing 16 describes the scenario of the user directions shown in drawing 21 is shown in drawing 31 .
[0197] In drawing, one VOB data for titles will be used for two scenarios, the scenario 1 of drawing 21 , and a scenario 2, in common. VOB#1 by which the independent scene shared between each scenario is equivalent to a scene 1, VOB#5 equivalent to a scene 5, and VOB#8 equivalent to a scene 8 are arranged as independent VOB at the part which is not an interleave block, i.e., a contiguous block.
[0198] the multi-angle-type scene shared between a scenario 1 and a scenario 2 -- setting -- respectively -- an angle type 1 -- VOB# -- 2 and an angle type 2 constitute a configuration, i.e., one angle type, from VOB#3, 1VOB constitutes an angle type 3 from VOB#4, and it considers as an interleave block further for the change between each angle type, and seamless playback of each angle type.
[0199] Moreover, in a scenario 1 and a scenario 2, the scene 6 and scene 7 which are a peculiar scene are taken as an interleave block, in order to carry out connection playback as seamlessly not to mention seamless playback of each scene as the common scene of order. As mentioned above, the scenario of the user directions shown by drawing 21 is realizable in DVD DS by the VOB DS for title playback shown in the playback control information and drawing 31 of the video title set shown in drawing 30 .
[0200] The seamless playback described in relation to the DS of a seamless above-mentioned DVD system is explained. They are the common scene sections, and is with the common scene section and the multi-scene section, and are the multi-scene sections, and in case seamless playback connects multimedia data, such as an image, voice, and a subimage, and is reproduced, it is reproducing without interrupting each data and information. As a factor of interruption of this data and information playback, some which are called the underflow of the so-called decoder in which the balance of the rate by which a source-data input is carried out in a decoder, and the rate which decodes the inputted source data collapses are one of things relevant to hardware.
[0201] Furthermore, in order for a user to understand the contents or information like voice, when playback data cannot secure the continuation playback time amount

demanded about playback of the data of which the continuation playback beyond a fixed time basis is required, some by which an informational continuity is lost are one of things about the special feature of the data reproduced. It calls it continuation information playback to secure the continuity of such information and to reproduce with seamless information playback further. Moreover, the playback which cannot secure an informational continuity is called discontinuous information playback, and it is further called un-seamless information playback. In addition, there is also until [no] and continuation information playback and discontinuous information playback are respectively seamless and un-seamless playback until it says.

[0202] Although there is no interruption in the seamless data playback which prevents a null or generating of interruption to data playback physically by the underflow of a buffer etc. at seamless playback, and the data playback itself like ****, in case a user recognizes information from playback data, it is defined as the seamless information playback which prevents sensing informational interruption.

the concrete approach of enabling seamless playback in this way which is a seamless detail -- drawing 23 -- and drawing 24 reference is carried out and it explains in detail later.

[0203] A title like the movie on a DVD medium is recorded for the system stream of the interleave above-mentioned DVD data using the authoring encoder EC. However, in order to provide with the gestalt which can use the same movie also in two or more different cultural spheres or countries, recording words for every language of each country needs to edit and record the contents as natural according to the ethical demand of each cultural sphere further. in such a case, a mass system called DVD in order to record two or more titles edited from the original title on the medium of one sheet -- even setting -- it will become impossible to have to drop a bit rate and to fill a demand called high definition Then, the approach of two or more titles sharing an intersection and recording only a different part for every title is taken. Thereby, a bit rate cannot be dropped but two or more titles a country exception or according to cultural sphere can be recorded on the optical disk of one sheet.

[0204] The title recorded on the optical disk of one sheet has the multi-scene section which has an intersection (scene) and that [non-intersection (scene)], in order to enable parental lock control and multi-angle-type control, as shown in drawing 21 .

[0205] In parental lock control, when the so-called scene for adults which is not suitable to children, such as a sexual scene and a violent scene, is contained in one title, this title consists of a common scene, a scene for adults, and a scene for minority. Such a title stream arranges the scene for adults, and the scene for un-becoming an adult as the multi-scene section prepared between common scenes, and is realized.

[0206] Moreover, in realizing multi-angle-type control in the usual single angle-type title, it realizes by arranging between common scenes by making into the multi-scene

section two or more multimedia scenes which photo an object and are obtained by predetermined camera angle, respectively. Here, although each scene is the same angle type which is raising the example of the scene photoed by different angle type, it may be a scene photoed by different time amount, and may be data, such as computer graphics.

[0207] If two or more titles share data, in order to move light beam LS from a common area to the non-common area of data, optical pickup will be inevitably moved to the location where it differs on an optical disk (RC1). The problem that it is difficult to reproduce, without the time amount which this migration takes becoming a cause, and breaking off a sound and an image, i.e., seamless playback, arises. What is necessary is just to have a track buffer for the time amount which is theoretically equivalent to the worst access time (stream buffer 2400), in order to solve such a trouble. Generally, the data currently recorded on the optical disk are once stored in a track buffer as data, after being read by the optical pickup and performing predetermined signal processing. The stored data are decoded after that and reproduced as a video data or audio data.

[0208] Work of the stream buffer 2400 called a track buffer in a DVD system to below the concrete technical problem of an interleave is explained briefly. Momentary correspondence is impossible for control of the rotational frequency of a drive of an optical disk etc., and the input Vr to the stream buffer 2400, i.e., the transfer rate from an optical disk, serves as an almost fixed rate. Moreover, in DVD, the transfer rate Vo from a track buffer to an output, i.e., a decoder, is an adjustable rate, and the compressed data of video changes with a request of a user or image quality. In the DVD system, the transfer rate Vr from a disk is as fixed as about 11 Mbps(es), and Vo serves as adjustable as a maximum of 10 Mbps. Thus, if there is a gap in Vr and Vo and the transfer from a disk is performed continuously, overflow of the stream buffer 2400 will occur. Therefore, the transfer and the so-called intermittent transfer are performed in the regenerative apparatus, stopping so that the stream buffer 2400 may not carry out overflow of the transfer from a disk. In the usual continuation playback, the stream buffer is always controlled by the condition liable to overflow.

[0209] If such a stream buffer 2400 is used, even if the read-head unit (optical pickup) 2006 jumps between the data on Disk M in order to move logical sector LS, and read-out of data breaks off to some extent, data are not broken off and playback is possible. However, in actual equipment, as for jump time amount, 200msec-2sec will also be changed according to the location on the distance or Disk M. By mass optical disk M as which high definition is demanded, although it is also possible to prepare the track buffer (stream buffer) 2400 of only the capacity which can absorb the time amount concerning the jump, if it is going to guarantee seamless playback even if a compression bit rate is also as high as 10Mbps(es) and is the jump from which location at an average of four to 5 Mbps, and the maximum rate, much memory will be needed

and Decoder DC will become a large sum. If a product realistic also in cost is offered, since the memory space which can be carried in Decoder DC will be restricted, a limit of the jump time amount which data can break off and reproduce as a result will exist.
[0210] The mode of operation of the read-head unit 2006 and the relation of the are recording amount of data in the stream buffer 2400 are shown in drawing 32 . In this drawing, Tr is a period when an optical pickup reads data from optical disk RC, and Tj is a jump period when an optical pickup moves between logical sectors. A straight line L1 expresses transition of the amount of data Vd accumulated into a track buffer 2400 during the data read-out period Tr. A straight line L2 expresses transition of the amount of data Vd accumulated into a track buffer 2400 during the jump period Tj.
[0211] During the data read-out period Tr, it is the transfer rate Vr, and it supplies the read-head unit 2006 to a track buffer 2400 at the same time it reads data from optical disk M. On the other hand, a track buffer 2400 supplies data to each decoders 3801, 3100, and 3200 at the transfer rate Vo. Therefore, the are recording amount of data Vd in the track buffer 2400 of the data read-out period Tr increases with the difference (Vr−Vo) of these two transfer rates Vr and Vo.
[0212] Since the read-head unit 2006 is jumped during the jump period Tj, there is no supply of the data read from optical disk [to a track buffer 2400] M. However, since the data supply to decoders 3801, 3100, and 3200 is continued, the are recording amount of data Vd in a track buffer 2400 decreases according to the transfer rate Vo to a decoder. In addition, in this drawing, although the example which is continuing and changing is shown, since decoding stages differ for every class of each data in fact, the transfer rate Vo to a decoder changes intermittently, but in order to explain the concept of the underflow of a buffer, it is being shown simple here. Although the read-head unit 2006 reads this from optical disk M continuously with a fixed linear velocity (CLV), it is the same as reading intermittently at the time of a jump. As mentioned above, if the inclination of straight lines L1 and L2 is set to L1 and L2, it can be expressed by the following formulas, respectively.
$L1=Vr-Vo$ (formula 1)
$L2=Vo$ (formula 2)
Therefore, when the jump period Tj is long and the data in a track buffer 2400 become empty, an underflow will happen and decoding will stop. If the jump time amount Tj is stored within the time amount from which the data in a buffer 2400 become empty, decoding can be continued without breaking off data. Thus, the time amount which can jump the read-head unit 2006 is called the time amount in the time which can be jumped, without causing the underflow of data in a track buffer 2400.
[0213] In addition, although physical migration of the read-head unit 2006 is raised with the above-mentioned explanation as an example as a cause of the underflow of the data in a track buffer 2400, the following causes are also included in addition to it. The size of a buffer is too small to the decoding rate of a decoder. Moreover, the size

of each input unit of two or more kinds of VOB(s) in the playback bit stream St 61 inputted into a track buffer 2400 from the multimedia bit stream playback section 2000 is unsuitable to buffer size. Furthermore, the factor of various underflows of the entry of data which the sequence of each input unit of two or more kinds of VOB(s) contained in the playback bit stream St 61 decodes next to a decoding rate while decoding the data under present decoding since it is unsuitable stopping doing etc. is included.

[0214] In the case of the regenerative apparatus of a digital video disc, as an example which produces such an underflow, the read-out rate from a disk serves as a value of [rate / of 11Mbps(es) and AV data / maximum compression] 4M bit in the capacity of 10Mbps(es) and a track buffer. while having jumped, it is made for the underflow (for the input to a track buffer not to fulfill an output) of a track buffer not to occur in this regenerative apparatus -- being alike -- even if there is playback of AV data of worst 10Mbps while having jumped if it is control liable to overflow, the time amount of a maximum of 400 msec which can be jumped can be guaranteed at the time of the usual continuation playback.

[0215] The value of time amount 400msec which can be jumped is a realistic value also with actual equipment. In an actual regenerative apparatus, the distance which can be jumped between 400msec(s) is 500 truck extent. The time amount which can be jumped can define the distance which can be jumped by replacing time amount by the amount of data again. That is, it is the amount of data which can move the sequential data stream on a disk to the time amount which can be jumped. For example, the amount of data equivalent to time amount 400msec which can be jumped is abbreviation 250M bit. In addition, it cannot be overemphasized that the sector on [the amount of data defined as a distance which can be jumped to] a record medium, and an actual distance in the unit of a truck can be easily found from the recording method in the record medium and recording density.

[0216] an above-mentioned jump is possible -- distance 250M bit -- an average of 5 -- in M-bit per second AV data, it is equivalent to the playback time amount for 50 seconds, and has been 50 or less seconds in more nearly quality AV data. Moreover, in data, such as a movie as which the cut of a specific scene may be required on an education top or a cultural problem, many are 5 minutes and a long thing from 2 minutes, and the die length of those cut scenes is about 10 minutes. To such a cut scene, without displaying a cut scene, in the case of the cut screen for 5 minutes, a precedence scene and a consecutiveness screen do not break off and it cannot connect with an above-mentioned regenerative apparatus only by having connected the cut scene to the scene to precede and connecting a consecutive scene further, for example. That is, in one jump, the data showing the cut scene for [it described above] 5 minutes cannot be jumped.

[0217] Moreover, even if it jumps cut scene data over the jump time amount of 400 or

more msecs, it cannot guarantee that the compression rate Vo of AV data, i.e., the consumption rate from a track buffer, may become near the 10Mbps, and a buffer does not cause an underflow. Although two kinds of AV data, the case where it cuts, and when not cutting, are prepared as other cures and recording on a disk is also considered In this case, the limited disk capacity cannot be used effectively but it becomes difficult to become AV data of low quality and to fill a request of a user in the case where many data for time amount must be recorded on a disk depending on the case.

[0218] The concept of the data sharing between two or more titles is shown in drawing 33 . As for TL1, in the first title, in this drawing, TL2 expresses the contents of data of the second title. That is, first title TL1 is constituted by the data DbA continuously reproduced with progress of time amount T, Data DbB, and Data DbD, and second title TL2 is constituted by Data DbA, Data DbB, and Data DbC. These data DbA, Data DbB, Data DbD, and Data DbC are VOB(s), and have time amount T1 and T2, T3, and the display time of T2, respectively. When recording such two titles TL1 and TL2, as shown in TL 1_2, it is set as the DS which sets Data DbA and Data DbD to first title TL1 and second title TL2, sets the data DbB and DbC of a proper to time amount T2 (change section) as common data, respectively, changes, and can be reproduced. In addition, in drawing 33 , although it seems that a time gap is between each data, this is because it is intelligible and the salvage pathway of each data is shown using an arrow head, and it cannot be overemphasized that there is no time gap in fact.

[0219] The condition of being recorded on drawing 34 by optical disk M so that the data of such a title TL 1_2 may be reproduced continuously is shown. What constitutes the title which these data DbA, DbB, DbC, and DbD inner-followed is arranged on Truck TR (drawing 9) in principle at a continuation field. That is, as the data DbA which constitute first title TL1, Data DbB, and data DbD, it is arranged and the data DbC of a proper are arranged at second title TL2 at the degree. Thus, if it arranges, when the read-head unit 2006 moves Data DbA, DbB, and DbD on Truck TR about first title TL1 synchronizing with the playback time amount T1 and T2 and T3, ** it does not break off the contents of a title continuously, it is reproducible seamlessly.

[0220] However, in second title TL2, as is shown by arrow-head Sq2a all over drawing, the read-head unit 2006 will not become, if it comes to reach Data DbC, before it jumps over the distance of two data DbB and DbD and the playback time amount T2 begins, after reproducing Data DbA to the playback time amount T1. Furthermore, after playback of this data DbC, as arrow-head Sq2b shows, the read-head unit 2006 must return the distance of two data DbC and DbD again, and must arrive at the head of Data DbD even before initiation of playback time amount T3. Reproducing seamlessly between Data DbA, between Data DbC and Data DbC, and Data DbD for

the time amount which such read-head unit 2006 migration between data takes cannot be guaranteed. That is, seamless playback cannot be performed if the track buffer 2400 which the distance between each data mentioned above is not extent which does not carry out an underflow.

[0221] the definition of an interleave -- in order to make selection possible from the above things to omit for a certain scene, and two or more scenes, the situation where the data of a non-choosing scene are interrupted and recorded between common scene data and selection scene data by the data unit belonging to each scene on the truck of a record medium since it is recorded by the arrangement which continued mutually starts inevitably. In such a case, since the data of a non-choosing scene must be accessed before accessing the data of the selected scene and decoding if data are read in the sequence currently recorded, the seamless connection with the selected scene is difficult.

[0222] However, in a DVD system, the seamless connection between such two or more scenes is possible taking advantage of the outstanding random access engine performance to the record medium. Two or more division data units to which the data belonging to each scene are divided into two or more units which have the predetermined amount of data, and these different scenes belong by that is, the thing mutually arranged in predetermined sequence The selected scene can be reproduced by accessing intermittently the data with which the scene chosen, respectively belongs, and decoding them for every division unit, by arranging in the jump engine-performance range, without data breaking off. That is, seamless data playback is guaranteed.

[0223] Division of the seamless connection method in this invention and data and the concept of an array are explained below using the input transfer rate Vr of the detail definition above-mentioned track buffer of an interleave, and the consumption rate Vo of data. In drawing 32 , the consumption rate Vo of data has the relation of Vr>Vo, and reads the amount of data of a certain amount at a rate Vr using the difference, it buffers in a track buffer, data are stored, and data are consumed to time amount until an optical pickup moves to the location where the following read-out data are arranged. Even if it repeats this actuation, the division data unit of the predetermined amount of data which belongs to each scene so that a track buffer may not carry out an underflow is arranged discretely. An in TABU division unit and the in TABU division unit after arrangement are defined for the division data unit which has sufficient amount of data to buffer arranging data so that such seamless data playback may be guaranteed in an interleave, a call, and the above-mentioned track buffer as the interleave unit ILVU, respectively.

[0224] When choosing one scene from two or more scenes, the above interleaves are needed to two or more VOB(s) which constitute the two or more scenes. Two interleave units which continue on the time-axis belonging to the selected scene are

separated by the interleave unit more than the piece belonging to other scenes arranged in the meantime. Thus, the distance between the interleave units belonging to the two same scenes which continued in time is defined as interleave distance.

[0225] For example, when a record medium is an optical disk, migration of 10000 sector takes the time amount of 260msec(s). Here, if migration for 10000 sectors of an optical pickup is made into interleave unit distance, the predetermined amount of data of an interleave unit can be decided based on the difference of the input rate Vr to a track buffer, and an output rate Vo, and the amount of a track buffer. For example, the amount of track buffers is further made into 3M bit noting that immobilization of Vr=11Mbps and Vo=8Mbps, i.e., the compressed data of a fixed rate, is reproduced. As shown in the above-mentioned, when migration between interleave units considers as 10000 sectors, there is the need for an interleave unit to input into a track buffer so that the playback amount of data for 260msec(s) may be accumulated in a track buffer before migration.

[0226] In this case, the playback amount of data for 260msec is 2080K bits, and in order to store that data in a track buffer before the migration during an interleave, it needs to input source data at the rate of the difference of the transfer rates Vr and Vo more than 0.7 second (2080 kilobits/(11-8) megabits per second). Thus, the time amount which reads the source data of an initial complement from a record medium M is defined as the minimum are recording read-out time amount in order to prepare for the data consumption by the decoder in jump time amount and to store data before a jump at a track buffer into jump time amount until an optical pickup moves to the target interleave unit ILVU and resumes read-out of data again.

[0227] That is, the amount of data which must be read becomes more than 7.7M bit as an interleave unit. When this value is converted by playback time amount, the amount of data which has the playback time amount below for 20 seconds between an interleave unit with the playback time amount more than 0.96 seconds and its interleave unit can be arranged. By making the consumption bit rate of a system stream low, the minimum are recording read-out time amount is made small. Consequently, the amount of data of an interleave unit can also be lessened. Furthermore, time amount which can be jumped can be lengthened, without changing the amount of data of an interleave unit.

[0228] One example of connection of a scene is shown in drawing 35 . When there are a case where it connects with Scene D from Scene A, a case where a part of scene D is transposed to Scene B, and a case where it transposes to Scene C by different time amount with the scene replaced on Scene B, as shown in drawing 35 , the scene D replaced is divided (a scene D-1, a scene D-2, and scene D-3). As the system stream equivalent to Scene B, a scene D-1, Scene C, and a scene D-2 mentioned above, it is Vo (= 8Mbps). The input to a track buffer is Vr (= 11Mbps). Each scene It arranges with Scene B, a scene D-1, Scene C, and a scene D-2, there is the amount

of data of each scene length beyond a value (= 0.96 seconds) which was mentioned above, and it is the inside [between each scene to connect] of distance which can be jumped [above-mentioned]. What is necessary is just to be able to arrange.

[0229] However, it is disagreeable ****** to which it becomes an interleave of two streams and, as for the time amount corresponding to an interleave of three streams, and a scene D-2 in the time amount corresponding to a scene D-1 in an interleave, processing becomes complicated in interleaving Scene D, and the scene C from which an ending point differs even when a start point is the same and Scene B like drawing 35 . In interleaving two or more VOB(s), VOB the start point and whose ending point corresponded is interleaved, it is [direction] general and processing also becomes easy. That is [drawing 36 reproduced the scene D-2 on the scene C of drawing 35 , connected with it and made in agreement branching and the joint to two or more scenes], a start point and an ending point are made in agreement, and interleaving two or more VOB(s) is shown. In a DVD system, in interleaving a scene with branching and association, a start point and an ending point are made in agreement, and it is surely interleaving them.

[0230] Below, the concept of an interleave is explained in more detail. Although there is a system stream of AV (an audio and video) mentioned above as an interleave method with a hour entry, this interleave method will be arranged so that the near data of buffer input time of day may become near about an audio and video with the same time-axis, and the amount of data including the almost same playback time amount will be arranged by turns. However, in titles, such as a movie, although it is necessary to replace on a new scene, time amount length differs between the scenes of these plurality in many cases. In such a case, when an interleave method like AV system stream is applied, if the time difference between scenes is less than the above-mentioned time amount that can be jumped, it can absorb this time difference with a buffer. However, if the time difference between scenes is beyond the time amount that can be jumped, it will become impossible to seamless reproduce a buffer, without this time difference being unabsorbable.

[0231] In such a case, if the amount of data which can be accumulated at once is enlarged, the large time amount which can be jumped can be taken and it will become easy to enlarge size of a track buffer, and to do an interleave unit and arrangement in comparison. However, if the amount of data which lengthens an interleave unit and considering interactive actuation which is seamlessly changed out of two or more streams, such as a multi-angle type, is accumulated at once is made [many], it will become the difficulty that the in-stream playback time amount of the angle type in front of after actuation of a stream change becomes long, and the change of the stream on a display becomes slow as a result.

[0232] That is, in the track buffer of an authoring decoder, in case an interleave is consumed in the encoding data supplied from the stream source for decoding of a

decoder, it is carrying out as [optimize / the array in the division unit for every data of a source stream] so that it may not become an underflow. As a factor of the underflow of this buffer, by the big thing, the mechanical displacement of an optical pickup occurs and a small thing has the decoding rate of a communication system etc. The mechanical displacement of an optical pickup mainly becomes a problem, when scanning and reading the truck TR on optical disk M. So, an interleave is required in case the data on the truck TR of optical disk M are recorded. Furthermore, in priority distribution of play-by-play broadcasting or cable television, satellite broadcasting service, etc. not reproducing a source stream from a record medium by the user side like wireless distribution but receiving supply of a direct source stream, factors, such as a decoding rate of a communication system, pose a problem. In this case, the source stream distributed needs to be interleaved.

[0233] If it says strictly, interleaves will be intermittent and arranging each data in a source stream in a predetermined array about the target source data in the source stream which consists of a source-data group containing two or more source data inputted continuously so that it may access in order and the information on the target source data can be reproduced continuously. Thus, the downtime of an input of source data to reproduce is defined as the jump time amount in interleave control.

[0234] The interleave method for specifically arranging on the disk in which random access is possible so that the video object containing the video data which compressed general titles, such as a movie in which branching of a scene and association exist as mentioned above, by the variable-length-coding method can be reproduced without breaking off is not shown clearly. Therefore, in arranging such [actually] data on a disk, a thinking error comes to be required based on the actually compressed data. Thus, in order to arrange so that two or more video objects can be reproduced seamlessly, it is necessary to establish an interleave method.

[0235] Moreover, in the application to DVD mentioned above, it divides and arranges in the GOP unit which is a unit of compression of video in the location of a certain time amount range (nub pack NV) with a boundary. However, a GOP data length is insertion of coding in a frame for a request of a user and high definition-ized processing etc., and since it becomes a variable-length data, the management pack (nub pack NV) location depending on playback time amount may be changed. Therefore, the jumping point to the data of the time of a change-over of an angle type or the following order of playback is not known. Moreover, if two or more angle types are interleaved even if the following jumping point is known, the data length which should be read continuously is unknown. That is, a data termination location will be known only after reading another angle-type data, and the change of playback data will become slow.

[0236] This invention proposes the approach and equipment which enable seamless data playback with the following operation gestalten in an optical disk with the DS

which shares data among two or more titles, and uses an optical disk efficiently in view of the above-mentioned trouble, and realizes the new function of multi-angle-type playback.

[0237] With reference to an interleave block, the unit structural drawing 24 , and drawing 37 , the interleave method which enables seamless data playback is explained. By drawing 24 , branching playback is carried out from one VOB (VOB-A) to two or more VOB(s) (VOB-B, VOB-D, VOB-C), and the case where it combines with one VOB (VOB-E) after that is shown. Drawing 37 shows the case where these data have actually been arranged on the truck TR on a disk.

[0238] A reproductive start point and a reproductive ending point are an independent video object, and arrange VOB-A and VOB-E in drawing 37 to a continuation field in principle. Moreover, as shown in drawing 24 , about VOB-B, VOB-C, and VOB-D, a reproductive start point and an ending point are made in agreement, and interleave processing is performed. And the field by which interleave processing was carried out is arranged as an interleave field to the continuation field on a disk. Furthermore, the above-mentioned continuation field and the interleave field are arranged in the reproductive sequence of the truck pass Dr, i.e., the direction. The case where two or more VOB(s), i.e., VOBS, have been arranged on Truck TR is shown in drawing 37 .

[0239] In drawing 37 , they are two kinds of interleave blocks which data considered the data area arranged continuously as the block, and the block made in agreement the above-mentioned start point, the contiguous block and start point which arrange continuously VOB which the ending point has completed independently, and the ending point, and interleaved two or more of the VOB(s). In order of playback, those blocks have block 1, block 2, block 3, ..., block 7, and the structure arranged, as shown in drawing 38 .

[0240] In drawing 38 , system stream data VTSTT_VOBS consists of blocks 1, 2, 3, 4, 5, 6, and 7. VOB1 is arranged independently at the block 1. Similarly, VOB 2, 3, 6, and 10 is arranged independently at blocks 2, 3, 5, and 7, respectively. That is, these blocks 2, 3, 5, and 7 are contiguous blocks.

[0241] On the other hand, VOB4 and VOB5 are interleaved and arranged at the block 4. Similarly, three VOB(s), VOB7, VOB8, and VOB9, are interleaved and arranged at the block 6. That is, these blocks 4 and 6 are interleave blocks. The DS in a contiguous block is shown in drawing 39 . In this drawing, VOB-i and VOB-j are arranged as a contiguous block at VOBS. VOB-i and VOB-j in a contiguous block are divided into the cel which is a still more logical playback unit as explained with reference to drawing 16 . Drawing 39 shows the thing of VOB-i and VOB-j which consists of three cel CELL#1, CELL#2, and CELL#3, respectively. The cel consists of one or more VOBU(s), it is the unit of VOBU and the boundary is defined. As a cel is shown in the program chain (it calls Following PGC) which is the playback control information of DVD at drawing 16 , the positional information is described. That is, the

address of VOBU of cel initiation and VOBU of termination is described. VOB and the cel defined in it are recorded on a continuation field so that it may be clearly shown by drawing 39 , and a contiguous block may be reproduced continuously. Therefore, playback of a contiguous block is satisfactory.
[0242] Next, the DS within an interleave block is shown in drawing 40 . In an interleave block, each VOB is divided per interleave unit ILVU, and each interleave unit belonging to VOB is arranged by turns. And a cel boundary is defined independently as the interleave unit. In this drawing, while VOB-k is divided into four interleave units ILVUk1, ILVUk2, ILVUk3, and ILVUk4, two cel CELL#1k and CELL#2k are defined. Similarly, while VOB-m is divided into ILVUm1, ILVUm2, ILVUm3, and ILVUm4, 2 cel CELL#1m and CELL#2m are defined. That is, a video data and audio data are contained in the interleave unit ILVU.
[0243] In the example of drawing 40 , two different VOB-k and each different interleave units ILVUk1, ILVUk2, ILVUk3, and ILVUk4 of VOB-m, and ILVUm1, ILVUm2, ILVUm3 and ILVUm4 are arranged by turns in the interleave block. The seamless playback to branching and the still more independent scene from one of the two or more scenes of those is realizable to one of a scene to two or more of the independent scenes by interleaving each interleave unit ILVU of two VOB(s) in such an array. Thus, by interleaving, seamless refreshable connection of a scene with branching association in the case of many can be made.
[0244] When connecting with the scene D-3 which is the middle of being Scene D after connecting with Scene B from Scene A and completing Scene B, as shown in drawing 35 of the deformation above-mentioned for interleave implementation, Seamless playback can be performed, also when there are three branching scenes in the case of connecting with the scene D-2 which is the middle of being Scene D after connecting with Scene C from Scene A and completing Scene C, when connecting with the head of Scene A to the scene D. Moreover, by connecting the scene (scene D-2) of order, a start point and an ending point are made in agreement in drawing 36 , and it can unite with the DS of this invention at it so that it may be shown. Thus, correspondence is possible also when deformation of a scene which performs the copy of a scene etc. and makes a start point and an ending point in agreement is quite complicated.
[0245] The example of an interleave algorithm including the correspondence to the video data which is variable-length correspondence, next the variable-length data of an interleave is explained below. In interleaving two or more VOB(s), it divides each VOB into the interleave unit of the same predetermined number fundamentally. Moreover, the amount of data can be calculated about each of the interleave unit of these predetermined numbers with the distance which can move to the bit rate, the jump time amount, and its jump time amount of VOB interleaved and the amount of track buffers, the input rate Vr to a track buffer, and the location of VOBU. Each

interleave unit consists of VOBU units, and the VOBU consists of one or more of the GOP(s) of an MPEG method, and usually has the amount of data for playback time amount for 0.4 – 1 second.

[0246] Moreover, in interleaving, it arranges by turns the interleave unit ILVU which constitutes respectively different VOB. when there are some which are not filled to the minimum interleave unit length among two or more interleave units interleaved by VOB of the shortest length among two or more VOB(s) When the sum total of two or more interleave unit length constituted from VOB(s) other than above-mentioned ****** VOB among two or more VOB(s) is larger than the interleave distance of the shortest length Thus, since an underflow will occur if interleaved VOB of the shortest length is reproduced, in seamless playback, there is nothing and it becomes un-seamless playback.

[0247] Like ****, with this operation gestalt, it judges before encoding whether interleave arrangement is possible, and it considers so that encoding processing may be carried out. That is, it can judge whether it can interleave or not from the die length of each stream before encoding. Thus, since the effectiveness of an interleave can be known in advance, reprocessing of readjusting in TABU conditions and re-encoding them after encoding and an interleave, can be prevented.

[0248] Terms and conditions, such as a bit rate of VOB recorded when enforcing concretely the interleave approach for recording on the optical disk of this invention, and engine performance of the disk to play, are described first.

[0249] When interleaving, the input rate Vr and output rate Vo to a track buffer have already described becoming the relation of Vr>Vo. That is, each maximum bit rate of VOB which interleaves is set below to the input rate Vr to a track buffer. Let B be a value below Vr for each of that maximum bit rate of VOB. In decision whether the interleave in which seamless playback is possible is possible, if it assumes that two or more VOB(s) of all that interleave were encoded by CBR of the maximum bit rate B, the amount of data of an interleave unit increases most, and time amount reproducible by the amount of data which can be arranged in the distance which can be jumped will become short, and it will serve as severe conditions for an interleave. Hereafter, each VOB is explained as what is encoded by CBR of the maximum bit rate B.

[0250] In a regenerative apparatus, JM and the input data bit rate to the track buffer of a regenerative apparatus are set to BIT for the distance which expressed with the amount of data the distance of the disk which can be jumped by JT and its jump time amount JT for the jump time amount of a disk and which can be jumped.

[0251] when it raises with the example of actual equipment, jump time amount JT=400msec of a disk and the jump corresponding to the jump time amount JT are possible -- it becomes distance JM=250M bit. Moreover, the maximum bit rate B of VOB is an MPEG method, and is set to a maximum of 8.8 Mbps in consideration of an average of 6 Mbps extent being required in order to acquire the image quality more

than the conventional VTR.

[0252] Here, based on values, such as jump distance, jump time amount, and data readout time amount from a disk, the standard of the value is first computed by setting playback time amount of the amount ILVUM of minimum interleave unitdatas, and its minimum interleave unit to ILVUMT.

[0253] The following formulas can be obtained as playback time amount ILVUMT of the minimum interleave unit.

ILVUMT >= JT + ILVUM/BIT (formula 3) ILVUMT x B = ILVUM (formula 4) It becomes minimum interleave unit playback time amount ILVUMT=2sec and minimum GOP block data GM=17.6M bit from a formula 3. That is, it turns out that the minimum values of the interleave unit which is the smallest unit of a layout are 15 frame structures, then the amount of data for 4GOP in NTSC about the amount of data for 2 seconds, and a GOP configuration.

[0254] Moreover, as conditions in the case of interleaving, it is that interleave distance is below the distance that can be jumped.

[0255] It becomes conditions that it is shorter than the time amount which the sum total playback time amount of VOB except VOB of the shortest length of playback time amount can reproduce in interleave distance in two or more VOB(s) which perform interleave processing.

[0256] in the above-mentioned example, a jump is possible -- in distance JM=250M bit and maximum bit rate 8.8Mbps of VOB, the time amount JMT refreshable at the amount of data of the interleave distance JM can be found with 28.4 seconds. If these values are used, the conditional expression which can be interleaved is computable. every of an interleave field -- if the interleave number of partitions is set to v for the number of partitions of VOB when dividing VOB into the interleave block of the same number, a formula 5 will be obtained from the conditions of the minimum interleave unit length.

[0257] (The playback time amount of the shortest length VOB) / ILVUMT <= v (formula 5) A formula 6 is obtained from the conditions of the playback time amount which can be jumped again.

v <= (playback time amount of VOB except shortest length VOB)/JMT (formula 6) If the above conditions are fulfilled, it is theoretically possible to interleave two or more VOB(s). Since an interleave unit consists of only boundaries of each VOBU when it thinks still more nearly actually, it is necessary to add amendment for VOBU to the value computed by being based as the above-mentioned formula. That is, it is required to reduce the maximum time amount of VOBU from the time amount JMT which adds the maximum time amount (1.0 seconds) of VOBU to the playback time amount ILVUMT of the above-mentioned minimum interleave unit, and can be reproduced in interleave distance as amendment to the conditional expression of said formula 2, a formula 3, and a formula 4.

[0258] As a result of calculating the conditions for interleaving the scene which serves as VOB before encoding as mentioned above, when it is judged that seamless refreshable interleave arrangement cannot be performed, it is necessary to make it make the number of partitions at the time of an interleave increase. That is, it is moving a consecutiveness scene or a front ** scene to an interleave field, and lengthening the scene used as VOB of the shortest length. Moreover, the same scene as the scene added to the shortest length scene also at other scenes is added to coincidence. Generally, from the minimum interleave unit length, since interleave distance is far large and the rate of increase of the value of the left part of a formula 4 is larger than the increment in the value of the right-hand side of a formula 6, it is making [many] the amount of migration scenes, and conditions can be fulfilled.
[0259] The data within such an interleave block of the relation of Vr>Vo are [the input rate Vr and output rate Vo of a track buffer] indispensable as mentioned above. moreover -- since a jump may occur immediately after interleave field ****** from a continuation field and it is necessary to store the data in front of an interleave field -- a part of VOB in front of an interleave field -- it is necessary to stop the bit rate of data
[0260] Moreover, about the part which connects with an interleave block from a contiguous block, it is required to jump immediately after going into an interleave block, to stop the maximum bit rate of the contiguous block in front of an interleave block, and to store data in a track buffer. The amount of [computable from the maximum bit rate of the interleave block reproduced after a contiguous block as the value / of the minimum interleave unit length] playback time amount becomes a standard.
[0261] Moreover, although the above makes the number of partitions of an interleave common to all VOB(s), when the difference in the die length of VOB is great, there is also the approach of carrying out grouping of the number of partitions to VOB set to u and VOB set to (u+1).
[0262] namely, every -- the number of partitions from which VOB from which the division which sets to u the minimum value of the number of partitions obtained by the formula 5 of VOB, and exceeds the minimum value is not obtained is obtained from a formula 4 as the number of partitions u -- until -- (u+1) the possible number of partitions of VOB is set to (u+1). The example is shown in drawing 41 .
[0263] The DS of the interleave unit (hereafter referred to as ILVU) in the gestalt of the further operation which starts this invention at drawing 42 is shown. This drawing shows constituting the die length more than the minimum interleave length obtained from the above-mentioned decoder engine performance, an above-mentioned bit rate, etc. determined by a formula 5 and the formula 6 by making into a boundary location the unit which sets just before the following nub pack NV to VOB by making into a head the nub pack NV explained in full detail with reference to drawing 20 as an interleave unit. Each VOB has the nub pack NV which is the management information

pack, and ILVU last pack address ILVU_EA which shows the address of the last pack of ILVU with which this VOBU belongs, and starting address NT_ILVU_SA of the next ILVU are described. In addition, these addresses are expressed with the number of sectors from NV of this VOBU as mentioned above. That is, in the nub pack NV, the positional information (NT_ILVU_SA) of the pack of the head of the following interleave unit which should be reproduced continuously, and the pack address (ILVU_EA) of the last of an interleave unit are described.
[0264] Moreover, when this VOBU exists in an interleave field, the starting address (NT_ILVU_SA) of the next ILVU is described. The number of sectors from NV of this VOBU describes as the address here.
[0265] by this thing, it is packed-data **** of the head of an interleave unit -- the information how far an interleave unit should be read with the positional information of the following interleave unit in the case can also be acquired. By this thing, the readout of only an interleave unit is possible and smooth jump processing to the following interleave unit can be performed further.
[0266] While explaining the concept of the multi-scene control based on this invention, it is attached and explains below to a multi-scene at the multi-scene section. The example which consists of scenes photoed by different angle type mentions. However, although each scene of a multi-scene is the same angle type, it may be a scene photoed by different time amount, and may be data, such as computer graphics. In other words, the multi-angle-type scene section is the multi-scene section.
[0267] With reference to parental drawing 43 , concepts of two or more titles, such as a parental lock and the Derek TAZU cut, are explained. This drawing shows an example of the MARUCHIREI Ted title stream based on a parental lock. When the so-called scene for adults which is not suitable to children, such as a sexual scene and a violent scene, is contained in one title, this title consists of common system streams SSa, SSb, and SSe, a system stream SSc for the adults containing the scene for adults, and a system stream SSd for un-becoming an adult only containing the scene for minority. Such a title stream arranges the system stream SSc for adults, and the system stream SSd for un-becoming an adult as a multi-scene system stream at the multi-scene section prepared among the common system streams SSb and SSe.
[0268] The relation of the system stream and each title which are described by the program chain PGC of the title stream constituted by above-mentioned business is explained. The common system streams SSa and SSb, the system stream SSc for adults, and the common system stream SSe are described in order by the program chain PGC1 of a ****** title. The common system streams SSa and SSb, the system stream SSd for minority, and the common system stream SSe are described in order by the program chain PGC2 of a ******** title.
[0269] thus, the thing for which the system stream SSc for adults and the system

stream SSd for minority are arranged as a multi-scene -- every -- after reproducing the common system streams SSa and SSb by the above-mentioned decoding approach based on description of PGC, the title which has the contents for adults is reproducible by choosing SSc for adults, reproducing in the multi-scene section, and reproducing the still more common system stream SSe. Moreover, on the other hand, the title for minority which does not contain the scene for adults is reproducible by choosing the system stream SSd for minority and reproducing in the multi-scene section. Thus, the multi-scene section which consists of two or more alternative scenes is prepared for the title stream, the scene reproduced among the scenes of this multi-section in advance is chosen, and the approach of generating two or more titles which have a scene which is fundamentally different from the same title scene is called parental lock according to the contents of selection.

[0270] In addition, although a parental lock is called a parental lock based on the demand from a viewpoint called minority protection, the viewpoint of system stream processing is a statically different technique which carries out title stream generation like ****, when a user chooses the specific scene in the multi-scene section beforehand. On the other hand, a multi-angle type is the technique in which a user changes the contents of the same title dynamically by choosing the scene of the multi-scene section at any time and freely during title playback.

[0271] Moreover, the title stream edit called the so-called Derek TAZU cut using a parental lock technique is also possible. Unlike playback at a theater, depending on time of flight, a title is unreproducible [on a movie etc. / the long title of playback time amount / to a ****** case] with the Derek TAZU cut to the last within an airplane. **** scene cut edit is attained at a maker's volition by splitting in such a situation, defining beforehand the scene which may be cut for title playback time amount compaction by decision of a title work person in charge, i.e., a director, and arranging the system stream containing such a cut scene, and the system stream by which a scene cut is not carried out at the multi-scene section. In such parental control, the seamless information playback which the seamless data playback in which buffers, such as connecting a playback image without conflict smoothly, i.e., video, and an audio, do not carry out an underflow in the knot from a system stream to a system stream, a playback image, and a playback audio reproduce on the visual and auditory senses, without not being unnatural and being interrupted again is needed.

[0272] With reference to multi-angle-type drawing 44 , the concept of the multi-angle-type control in this invention is explained. Usually, in an object, with progress of time amount T, a photograph is recorded and taken (it is only henceforth called photography), and a multimedia title is obtained. # Each block of SC1, #SM1, #SM2, #SM3, and #SC3 represents the photography unit time amount T1 and T2 which photos an object and is acquired by predetermined camera angle, respectively, and the multimedia scene obtained by T3. the scene photoed by the camera angle of

plurality (the first, the second, and the third) from which scene #SM1, #SM2, and #SM3 differ in the photography unit time amount T2, respectively -- it is -- henceforth -- the [the first, the second, and] -- it is called a 3 multi-angle-type scene.

[0273] Here, the example which consists of scenes photoed by the angle type by which multi-scenes differ is given. However, although each scene of a multi-scene is the same angle type, it may be a scene photoed by different time amount, and may be data, such as computer graphics. In other words, the multi-angle-type scene section is the multi-scene section, and it is the section which consists of the data which can reproduce alternatively two or more scenes which do not have data of the section what is restricted to the scene data obtained by actually different camera angle, and have the display time in the same period.

[0274] Scene #SC1 and #SC3 call it a basic angle-type scene those with a scene which were photoed by the camera angle of the same base at the photography unit time amount T1 and T3, i.e., before and behind a multi-angle-type scene, respectively, and henceforth. Usually, one of multi-angle types is the same as that of basic camera angle.

[0275] In order to make relation of these angle-type scenes intelligible, relay broadcast of baseball is explained to an example. Basic angle-type scene #SC1 and #SC3 are photoed in the basic camera angle consisting mainly of the pitcher who saw from the pin center,large side, a catcher, and a batter. First multi angle-type scene #SM1 is photoed in the first multi camera angle consisting mainly of the pitcher who saw from the backstop side, a catcher, and a batter. Second multi angle-type scene #SM2 is photoed by the second multi camera angle consisting mainly of the pitcher who saw from the pin center,large side, a catcher, and a batter, i.e., basic camera angle.

[0276] In this semantics, second multi angle-type scene #SM2 is basic angle-type scene #SC2 in the photography unit time amount T2. Third multi angle-type scene #SM3 is photoed in the third multi camera angle centering on Uchino who saw from the backstop side.

[0277] About the photography unit time amount T2, display (presentation) time amount overlaps and multi-angle-type scene #SM1, #SM2, and #SM3 call this period the multi-angle-type section. In the multi-angle-type section, by choosing freely this multi-angle-type scene #SM1, #SM2, and #SM3, a viewer can enjoy a favorite angle-type scene image from a basic angle-type scene, as the camera is changed. In addition, although it seems that a time gap is between basic angle-type scene #SC1 and #SC3, each multi-angle-type scene #SM1 and #SM2, and #SM3 all over drawing It is because it is intelligible and it is shown using an arrow head by which [of a multi-angle-type scene] this chooses what the path of the scene reproduced becomes, and it cannot be overemphasized that there is no time gap in fact.

[0278] With reference to drawing 23 , it explains from a viewpoint of data's connection

of the multi-angle-type control of a system stream based on this invention. The multimedia data corresponding to basic angle-type scene #SC are used as the basic angle-type data BA, and the basic angle-type data BA in the photography unit time amount T1 and T3 are set to BA1 and BA3, respectively. The multi-angle-type data corresponding to multi-angle-type scene #SM1, #SM2, and #SM3 are expressed as the second and third multi angle-type data MA1, MA2, and MA3 for a start, respectively. First, with reference to drawing 44, as explained, a favorite angle-type scene image can be changed and enjoyed by choosing any of the multi-angle-type scene data MA1, MA2, and MA3 they are. Moreover, there is no time gap between the basic angle-type scene data BA1 and BA3 and each multi-angle-type scene data MA1, MA2, and MA3 similarly.

[0279] In the case of an MPEG system stream, however, the data of the arbitration of each multi-angle-type data MA1, MA2, and MA3, At the time of connection with the connection from the precedence basic angle-type data BA 1, or the consecutiveness basic angle-type data BA 3, between the data reproduced depending on the contents of the angle-type data connected, discontinuity arises to playback information and it may be unable to reproduce automatically as one title. That is, although it is seamless data playback in this case, it is un-seamless information playback.

[0280] Furthermore, drawing 23 reference is carried out, two or more scenes within the multi-scene section [in / for ** / a DVD system] are reproduced alternatively, and the multi-angle-type change which is seamless information playback linked to the scene of order is explained.

[0281] the change MA1, MA2, and MA3 of an angle-type scene image, i.e., multi-angle-type scene data, -- inner -- it is completed even before playback termination of the basic angle-type data BA 1 which choosing one precedes -- if it kicks, it will not become. For example, it is very difficult to change to another multi-angle-type scene data MA 2 during playback of the angle-type scene data BA 1. Since multimedia data have the DS of MPEG of a variable-length-coding method, they are difficult to find the break of data in the middle of the data of a change place, and since inter-frame correlation is used for coding processing, as for this, an image may be confused at the time of a change-over of an angle type. In MPEG, GOP is defined as a batch which has at least one refresh frame. The KUROZUDO processing which does not refer to the frame which belongs to other GOP(s) in the batch of this GOP is possible.

[0282] If the multi-angle-type data 3 of arbitration, for example, MA, are chosen after in other words playback of the precedence basic angle-type data BA 1 finishes at the latest, before playback arrived at the multi-angle-type section, this selected multi-angle-type data is seamlessly reproducible. However, it is very difficult to reproduce other multi-angle-type scene data seamlessly in the middle of playback of multi-angle-type data. For this reason, during a multi-angle-type period, it is difficult

to acquire a free view which changes a camera.
[0283] Below, with reference to drawing 76 , drawing 77 , and drawing 45 , the data change during the multi-angle-type section is explained in detail.
[0284] The display time for every minimum angle-type change unit of the multi-angle-type data MA1, MA2, and MA3 shown in drawing 23 is in drawing 76 by example. In a DVD system, the multi-angle-type data MA1, MA2, and MA3 are the video objects VOB which are title edit units. The first angle-type data MA 1 have the interleave units (ILVU) A51, A52, and A53 which are the angle-type scene switchable smallest units which consist of GOP(s) of a predetermined number.
[0285] As for the interleave units A51, A52, and A53 of the first angle-type data MA 1, the display time for 6 seconds is set up by the display time for 1 second, 2 seconds, and 3 seconds, i.e., the first angle-type data MA1 whole, respectively. Similarly, the second angle-type data MA 2 have the interleave unit B51 to which the display time for 2 seconds, 3 seconds, and 1 second was set, B-52, and B53, respectively. Furthermore, the third angle-type data MA 3 have the interleave units C51, C52, and C53 to which the display time for 3 seconds, 1 second, and 2 seconds was set, respectively. in addition -- this example -- each multi-angle-type data MA1, MA2, and MA3 -- the display time for 6 seconds -- moreover, it cannot be overemphasized that these are examples and each interleave unit can also take other predetermined values although the front time amount according to individual is set up, respectively.
[0286] In the following examples, in an angle-type change, it is in the middle of playback of an interleave unit, and the case where the playback to the following angle type starts is explained. For example, when a change to the second angle-type data MA 2 is directed while reproducing the interleave unit A51 of the first angle-type data MA 1, playback of the interleave unit A51 is suspended and playback of second interleave unit B-52 of the second angle-type data MA 2 is started. In this case, an image and voice break off and it becomes un-seamless information playback.
[0287] Moreover, it does in this way, and if a change on the angle-type scene of the third angle-type data MA 3 is directed during playback of second interleave unit B-52 of the second angle-type data MA 2 which changed, interleave unit B-52 will be in the middle of playback, will suspend playback, and will change to playback of the interleave unit C53. It breaks off, when an image and voice change also in this case, and it becomes un-seamless information playback.
[0288] Although the change of a multi-angle type is performed about the above case, in order to suspend the playback in the middle of playback, it does not reproduce [that is,] and seamless information reproduce, without an image and voice breaking off.
[0289] Playback of an interleave unit is completed to below and how to change an angle type is explained to it. For example, when [of the time of carrying out the completion of playback of the interleave unit A51 which has the display time for 1

second to the second angle-type data MA 2 / second] a change to the second angle-type data MA 2 is directed while reproducing the interleave unit A51 of the first angle-type data MA 1, and it changes interleave unit B52, the start time of B-52 is after [of angle-type section head] 2 seconds. That is, since it means that it had changed as time course that it was after [of the head of the angle-type section] 1 second after 2 seconds, there is no time continuity. That is, since there are no continuities, such as voice, voice must have been reproduced continuously seamlessly.

[0290] Moreover, it does in this way, and during playback of second interleave unit B-52 of the second angle-type data MA 2 which changed, if a change on the angle-type scene of the third angle-type data MA 3 is directed, it will change after the completion of playback of interleave unit B-52 to the interleave unit C53. In this case, the completion of playback of B-52 is after [of the head of the angle-type section] 5 seconds, and the head of C53 becomes the 4-second back of an angle-type section head, and it will not continue as time amount progress. Therefore, neither of the image and voice which are reproduced between both unit B-52 and C53 are well connected like a front case. That is, in playback time amount and video, it is needed within the interleave unit of each angle type that a playback frame number is the same for the seamless information change of a multi-angle type.

[0291] Drawing 77 shows signs that the video packet V in the interleave unit of the multi-angle-type section and the audio packet A are interleaved. In drawing, BA1 and BA3 are basic angle-type scene data connected before and after an angle-type scene, and MAB and MAC are multi-angle-type scene data. The multi-angle-type scene data MAB consist of interleave units ILVUb1 and ILVUb2, and MAC consists of interleave units ILVUc1 and ILVUc2.

[0292] As for each of the interleave units ILVUb1, ILVUb2, ILVUc1, and ILVUc2, a video data and audio data are interleaved like illustration for every packet. In addition, the video packet and the audio packet are displayed as A and V all over this drawing, respectively.

[0293] Usually, the amount of data and display time of each packet A of an audio are fixed. In this example, each interleave units ILVUb1, ILVUb2, ILVUc1, and ILVUc2 reach, and have three audio packets [two / two / three] A at a time, respectively. That is, the number of audio packets of 5 and the number of video packets is [each of the multi-angle-type data MAB and MAC in the multi-angle-type section T2] as fixed as 13.

[0294] The angle-type control in the multi-angle-type section which consists of the multi-angle-type system stream (VOB) which has such packet structure is as follows. if it is going to change from the interleave unit ILVUb1 interleave unit ILVUc2 -- the number of sum total audio packets in these two interleave units ILVUb1 and ILVUc2 -- 6 -- becoming -- the predetermined number 5 in this multi-angle-type section T2 -- 1 -- many. Therefore, if these two ILVU(s) are connected and it reproduces, voice

will overlap by 1 audio packet.

[0295] On the contrary, since the number of sum total audio packets is 4 when it changes between the interleave unit ILVUc1 which has two audio packets, respectively, and ILVUb2, one becomes less than the predetermined number 5 of the multi-angle-type section T2. Consequently, if these two ILVU(s) are connected and it reproduces, the voice for 1 audio packet will break off. Thus, when the number of audio packets contained in ILVU to connect is the same as the predetermined number in the correspondence multi-angle-type section and there is, voice is not connected well but becomes the un-seamless information playback to which a noise gets or it breaks off to voice. [no]

[0296] Drawing 45 is drawing showing the situation of the multi-angle-type control in the case of having audio data with which the multi-angle-type data MAB and MAC differ in the multi-angle-type data shown in drawing 77 . The multi-angle-type data BA1 and BA3 are audio data showing common-before or after the multi-angle-type section voice. The first angle-type data MAB consist of first angle-type interleave unit ODIODETA ILVUb1 and ILVUb2 which is an angle-type change smallest unit within the multi-scene section. Similarly, the second angle-type data MAC consist of second angle-type interleave unit ODIODETA ILVUc1 and ILVUc2.

[0297] The voice wave of the audio data which the multi-angle-type data MAB and MAC in the multi-angle-type section T2 have in drawing 15 is shown. Respectively, one continuous voice of the multi-angle-type data MAB is formed with two interleave unit audio data ILVUb1 and ILVUb2. Similarly, the voice of the multi-angle-type data MAC is formed of the interleave units ILVUc1 and ILVUc2.

[0298] While reproducing the interleave unit audio data ILVUb1 of the beginning of the multi-angle-type data MAB, the case where it changes so that the multi-angle-type data MAC may be reproduced is considered here. In this case, a playback voice wave in case [that] playback of the interleave unit ILVUc2 is performed after the completion of playback of the interleave unit ILVUb1 turns into a synthetic wave of a voice wave of these two interleave units as it is shown by MAB-C. In the case of drawing 15 , this synthetic wave is discontinuous at an angle-type change over point. That is, voice is not connected well.

[0299] Moreover, in being data with which these audio data were encoded using a voice coding method called AC3, a still more serious problem occurs. The coding method of AC3 takes correlation of the direction of a time-axis, and encodes. Since correlation of the direction of a time-axis was taken and it has encoded, it will become impossible that is, to reproduce at the changing point of an angle type, even if it is going to cut the audio data of a certain angle type on the way and is going to connect with the audio data of another angle type at the time of multi-angle-type playback.

[0300] As mentioned above, when it has audio data according to individual for every angle type in a multi-angle type, the discontinuity between the connection data in a

change over point may arise at the time of an angle-type change. In such a case, for example with voice, depending on the contents of the data connected, a noise may get at the time of playback, or it may break off, and it may be said that displeasure is given to a user. Since discontinuity arises by the contents of the information reproduced and it is caused, this displeasure is avoidable by preventing reservation of an informational continuity, or informational interruption. Thus, seamless information playback is realizable.

[0301] The multi-angle-type control which starts this invention at drawing 46 is shown. In this example, three multi-angle-type data MA1, MA2, and MA3 are formed in the multi-angle-type section T2. The multi-angle-type data MA 1 consist of interleave units ILVUa1, ILVUa2, and ILVUa3 which are three more angle-type change smallest units. As for these interleaves units ILVUa1, ILVUa2, and ILVUa3, the display time for 2 seconds, 1 second, and 3 seconds is set up, respectively.

[0302] Similarly, the second multi angle-type data MA 2 consist of interleave units ILVUb1, ILVUb2, and ILVUb3 to which the display time for 2 seconds, 1 second, and 3 seconds was set, respectively. Furthermore, the third multi angle-type data MA 3 consist of ILVUc1, ILVUc2, and ILVUc3. Thus, it is as above-mentioned to be able to reproduce an image and voice continuously and for seamless information playback to be attained, without an image and voice breaking off or overlapping in an angle-type change location, even if the interleave unit which synchronized directs a change to different angle-type data since the same display time is set up.

[0303] In order to actually set up the display time of image data similarly for every angle-type change smallest unit in the multi-angle-type section so that it may have the DS shown in drawing 46 that is, it is making the same the playback frame number in an interleave unit. Processing is usually performed per GOP and compression of MPEG has a setup of the value of M and N as a parameter which defines the GOP structure. It is the frame number by which M is contained in the period of I or P picture, and N is contained in the GOP. In processing of encoding of MPEG, at the time of encoding, frequently, control of MPEG video encoding becomes complicated and a frog thing does not usually perform the value of M or N.

[0304] How to actually set up the display time of image data similarly for every angle-type change smallest unit in the multi-angle-type section is explained using drawing 78 so that it may have the DS shown in drawing 46 . In this drawing, since it is simple, there is nothing in the multi-angle-type section three, and two multi-angle-type data MAB and MAC are formed, and angle-type data shall have two interleave units ILVUb1 and ILVUb2, and ILVUc1 and ILVUc2, respectively, and show each GOP structure. Generally the structure of GOP is expressed with the value of M and N. It is the frame number by which M is contained in the period of I or P picture, and N is contained in GOP.

[0305] GOP structure is set as the value with the same value of M and N of the

interleave units ILVUb1 and ILVUc1 which synchronized, respectively in the multi-angle-type section. The value of M and N of the interleave units ILVUb2 and ILVUc2 is similarly set as the same value. GOP structure by thus, the thing set as the same value among the angle-type data MAB and MAC Display time of image data can be made the same between angle types for every angle-type change smallest unit. For example, since the change timing between these two ILVU(s) is the same when it changes from ILVUb1 of the angle-type data MAB to ILVUc2 of the angle-type data MAC An image can be reproduced continuously, without an image breaking off or overlapping in an angle-type change location.

[0306] Next, how to actually set up the display time of audio data similarly between angle types for every angle-type change smallest unit is explained using drawing 79 . This drawing shows signs that the video packet V and the audio packet A are interleaved, like drawing 77 in each of the interleave units ILVUb1, ILVUb2, ILVUc1, and ILVUc2 shown in drawing 80 .

[0307] Usually, the amount of data and display time of each packet A of an audio are fixed. As shown in drawing, in the multi-angle-type section, the number of audio packets with ILVUb1 and ILVUc1 is set up. [same] Similarly, the number of audio packets same as the interleave units ILVUb2 and ILVUc2 is set up. Thus, display time of audio data can be made the same between angle types for every angle-type change smallest unit by setting up the number of audio packets similarly in the unit of the interleave unit ILVU between each angle-type data MAB and MAC. Voice can be reproduced continuously, without a noise's being in voice in an angle-type change location, or breaking off, since angle-type change timing is the same when an angle type is changed between each angle-type data MAB and MAC by carrying out like this.

[0308] However, if in the case of voice it has audio data which have a voice wave according to individual for every minimum change unit within the multi-angle-type section as explained with reference to drawing 15 , audio data may be continuously unreproducible at the point changing [angle-type] only by making display time of audio data the same for every angle-type change smallest unit ILVU as mentioned above. What is necessary is just to have common audio data for every change smallest unit ILVU in the multi-angle-type section, in order to avoid such a situation. That is, in seamless information playback, the data which have the information which arranges data based on the contents of information which continued before and after the node of the data to reproduce, or is completed in a node are arranged.

[0309] The situation in the case of having common audio data in drawing 80 for every angle type in the multi-angle-type section is shown. Unlike drawing 45 , this Fig. expresses the situation of multi-angle-type control in case the multi-angle-type data MAB and MAC have audio data completed for every interleave unit ILVU which is a change unit, respectively. The audio data which compound a voice wave which is different by the angle-type change over point, and have a discontinuous voice wave

also by the changing [to the interleave unit ILVUc2 of the 2nd angle type]-from interleave unit ILVUb1 of 1st angle type in the multi-angle-type section of encoded audio data case since each audio data is completed per interleave unit ILVU like the above-mentioned are not reproduced so that it may have such DS. In addition, if audio data are constituted so that it may have the same voice wave per interleave unit ILVU, it is clear for seamless information playback to be possible like the case where it constitutes from a voice wave completed per interleave unit ILVU.

[0310] voice can be reproduce continuously , without being able to maintain correlation of the direction of a time-axis , and a noise get or break off to voice at the point change [angle type] , even when an angle type be change since audio data be complete per community or interleave unit ILVU between the interleave units ILVU which be the minimum change units between angle type data even when it be the data with which these audio data be encoded using a voice coding method call AC 3 . In addition, this invention may also reach throughout a title stream, without not limiting the class of angle-type data MA of the multi-angle-type section to 2 or 3 pieces, and also limiting the multi-angle-type section T2 per VOB. Thus, the information continuation playback defined previously is realizable. Above, actuation of the multi-angle-type control based on DVD DS was explained.

[0311] Furthermore, while reproducing one data in such the same angle-type scene section, how to record the multi-angle-type control data which can choose a different angle type on a record medium is explained.

[0312] In drawing 23 , the basic angle-type data BA 1 are arranged at a continuation data block, the interleave unitdata of MA1, MA2, and MA3 of the multi-angle-type section is arranged at an interleave block, and the multi-angle type in drawing is arranged at the contiguous block which the basic angle-type data BA 3 which continue after that follow. moreover, as DS corresponding to drawing 16 Constitute one cel and, as for the basic angle type BA 1, MA1, MA2, and MA3 of the multi-angle-type section constitute a cel, respectively. the cel corresponding to MA1, MA2, and MA3 furthermore -- a cell block (CBM= "a cell block head" of the cel of MA1 --) Constituting CBM= "the last of a cell block" of the cel of CBM= "the inside of a cell block" of the cel of MA2, and MA3, these cell blocks turn into a bearing block (CBT= "an angle type"). The basic angle type BA 3 serves as a cel linked to the bearing block. Moreover, connection between cels considers as seamless playback (SPF= "seamless playback").

[0313] The configuration of the stream which has the multi-angle-type section in the gestalt of this operation of this invention in drawing 47 , and the outline of the layout on a disk are shown. The multi-angle-type section is the section which can change a stream freely by assignment of a user. In the stream which has the DS shown in drawing 47 , while reproducing VOB-B, the change to VOB-C and VOB-D is possible. Moreover, during playback, the change to VOB-B and VOB-D is possible in VOB-C

similarly. Furthermore, during playback, the change to VOB-B and VOB-C can perform VOB-D freely.

[0314] The unit which changes an angle type is defined as an angle-type interleave unit (A-ILVU is called below) by making into an angle-type change unit the minimum interleave unit obtained on the conditions from the formula 3 and formula 4 which were shown by the above-mentioned. This A-ILVU consists of one or more VOBU(s). Moreover, A-ILVU management information is added with this A-ILVU. The nub pack NV mentioned above is equivalent to it.

[0315] As a gestalt of operation, the example which describes the pack address of the last of the A-ILVU concerned and the address of following A-ILVU several angle-type minutes is shown in drawing 48 . Although this Fig. is similar to the example of drawing 42 In this example, angle-type interleave unit A-ILVU It consists of two VOBU(s). In the nub pack NV of each VOBU ILVU last pack address ILVU_EA which shows the address of the last pack of ILVU with which this VOBU belongs -- and Starting address SML_AGL_C1_DSTA of the next ILVU for every angle-type data - SML_AGL_C9_DSTA (angle-type #1- angle-type #9) are described.

[0316] These addresses are expressed with the number of sectors from NV of this VOBU. In addition, in the field where an angle type does not exist, the data in which it is shown that an angle type does not exist, "0", are described. [for example,] It is obtaining the address of degree angle type with the pack address of this last, without reading information with excessive angle-type information, and it is possible to also perform a change about degree angle type. As the interleave approach in the multi-angle-type section, all angle types are set as the interleave border of the same time of day by making the interleave unit of an angle type into the minimum read-out time amount. That is, it is for changing an angle type in the engine-performance range of a player as quickly as possible. The data of an interleave unit are once inputted into a track buffer, and after that, the data of the angle type after a change are inputted into a track buffer, and if they are not after the data in the track buffer of a front angle type consuming, they cannot perform playback of degree angle type. In order to make a change about degree angle type quick, it is necessary to suppress an interleave unit to min. Moreover, in order to switch seamlessly, change time of day must also be the same. That is, between VOB(s) which constitute each angle type, an interleave unit and a boundary need to be common.

[0317] That is, between VOB(s), the playback time amount of the video encoding stream which constitutes VOB needs to be the same, and the same interleave boundary needs to be [time amount reproducible within the interleave unit in the same playback time amount of each angle type] common. VOB which constitutes each angle type needs to be divided into the interleave unit of the same number, and the playback time amount of this interleave unit needs to be the same by each angle type. That is, VOB which constitutes each angle type is divided into the interleave unit

of the same number N, and the k-th interleave (1 <=k<=N) unit needs to have the same playback time amount in each angle type.

[0318] furthermore -- for reproducing seamlessly between the interleave units between each angle type -- an encoding stream -- the inside of an interleave unit -- a conclusion, i.e., an MPEG method, -- closed one -- it is necessary to give the configuration of GOP and to take the compression method which does not refer to the frame besides an interleave unit If the technique is not taken, the interleave unit between each angle type cannot be connected seamlessly, and it cannot reproduce. Even when an angle-type change is operated by making it such a VOB configuration and an interleave unit boundary, it becomes possible to reproduce continuously in time.

[0319] Moreover, the number of the interleaves in the multi-angle-type section is determined from the number of interleave units of other angle types which can be arranged between the distance which can be jumped after reading an interleave unit. As an array for every interleave unit of each angle type after an interleave, the interleave unit of each angle type reproduced first is arranged in order of an angle type, and the interleave unit of each angle type reproduced next is arranged in order of an angle type. M (natural number with which M:1<=M<=9 is filled), and the m-th angle type for the number of angle types That is, angle-type #m (natural number of m:1 <=m<=M), If the n-th interleave unit [in / for the number of interleave units / N (N:1 or more natural numbers) and VOB] is set to interleave unit #n (natural number of n:1 <=n<=N) It is arranged in order of interleave unit #1 of angle-type #1, interleave unit #1 of angle-type #2, and interleave unit #1 of angle-type #3. Thus, it arranges after arrangement of angle-type #M of interleave unit #1 with interleave unit #2 of interleave unit #2 of angle-type #1, and angle-type #2.

[0320] In the case of the seamless change angle type which performs an angle-type change seamlessly The distance which must carry out the maximum jump at the time of migration between angle types if the die length of the interleave unit of each angle type is the minimum read-out time amount It is the distance to the interleave unit arranged by the last of the array of the interleave unit of each angle type with which a degree is reproduced from the interleave unit of the angle type arranged by the beginning among the arrays of the interleave unit of each angle type reproduced by the same time amount. If the number of angle types is set to An, jump distance needs to fill the following formulas.

[0321]

Maximum ILVU length x(An-1) x2 in an angle type <= Distance which can be jumped (formula 7)

Moreover, in the case of an un-seamless change multi-angle type, although it is necessary to perform playback of each angle type seamlessly, it does not need to be seamless at the time of migration between angle types. Therefore, if the die length of

the interleave unit of each angle type is the minimum read-out time amount, the distance which must carry out the maximum jump is the distance between the interleave units of each angle type. If the number of angle types is set to An, jump distance needs to fill the following formulas.

[0322]

Maximum ILVU length x(An-1) <= in an angle type Distance which can be jumped (formula 8)

Below, with reference to drawing 49 and drawing 50 , the management method of the mutual address in the change unit between each multi-angle-type data VOB in the multi-angle-type section is explained. Angle-type interleave unit A-ILVU is a data change unit, and drawing 49 shows the example the address of other A-ILVU is described to be to the nub pack NV of each A-ILVU. Drawing 49 is an example of address description for realizing seamless playback, i.e., the playback to which neither an image nor voice breaks off. That is, control which can read only the data of the interleave unit of the angle type which it is going to reproduce when an angle type is changed to a track buffer is enabled.

[0323] The video object unit VOBU is a data change unit, and drawing 50 shows the example the address of other VOBU(s) is described to be to the nub pack NV of each VOBU. Drawing 50 is address description which enables control of a change sake at other angle types near the changed time amount as early as possible, when changing un-seamless playback, i.e., an angle type.

[0324] In drawing 49 , next A-ILVU is described for each A-ILVU in time as the address of playback A-ILVU below about three multi-angle-type data VOB-B, VOB-C, and VOB-D. Here, angle-type number #1 and VOB-C are set to angle-type number #2, and VOB-D is set to angle-type number #3 for VOB-B. Multi-angle-type data VOB-B consists of angle-type interleave unit A-ILVUb1, A-ILVUb2, and A-ILVUb3. Similarly, VOB-C consists of angle-type interleave unit A-ILVUc1, and ILVUc2 and ILVUc3, and VOB-D consists of angle-type interleave unit A-ILVUd1, A-ILVUd2, and A-ILVUd3.

[0325] In the nub pack NV of angle-type interleave unit A-ILVUb1 As line Pb1b shows, the same relative address SML_AGL_C#1_DSTA of next angle-type interleave unit A-ILVUb2 of VOB-B, Relative address SML_AGL_C#2_DSTA of angle-type interleave unit A-ILVUc2 of VOB-C which synchronized with this angle-type interleave unit A-ILVUb2 as line Pb1c showed, And SML_AGL_C#3_DSTA which shows the relative address of angle-type interleave unit A-ILVUd2 of VOB-D as line Pb1d shows is described.

[0326] Similarly, as line Pb2b, Pb2c, and Pb2d show to the nub pack NV of A-ILVUb2, SML_AGL_C#1_DSTA which shows the relative address of following angle-type interleave unit A-ILVUb3 for every VOB, SML_AGL_C#2_DSTA which shows the relative address of A-ILVUc3, and SML_AGL_C#3_DSTA which shows the relative

address of A-ILVUd3 are described. The relative address is described by the number of sectors from the nub pack NV of VOBU contained in each interleave unit.

[0327] Also in VOB-C, furthermore, in the nub pack NV of A-ILVUc1 SML_AGL_C#2_DSTA which shows the relative address of next angle-type interleave unit A-ILVUc2 of the same VOB-C as line Pc1c shows, SML_AGL_C#1_DSTA which shows the relative address of angle-type interleave unit A-ILVUb2 of VOB-B as line Pc1b shows, And SML_AGL_C#3_DSTA which shows the relative address of angle-type interleave unit A-ILVUd2 of VOB-D as line Pb1d shows is described. Similarly, as line Pc2c, Pc2b, and Pc2d show to the nub pack NV of A-ILVUc2, following angle-type interleave unit A-ILVUc3 for every VOB, A-ILVUb3 and each relative address SML_AGL_C#2_DSTA of A-ILVUd3, SML_AGL_C#1_DSTA, and SML_AGL_C#3_DSTA are described. The relative address is described like description by VOB-B by the number of sectors from the nub pack NV of VOBU contained in each interleave unit.

[0328] similarly, it sets to VOB-D -- in the nub pack NV of A-ILVUd1 SML_AGL_C#3_DSTA which shows the relative address of next angle-type interleave unit A-ILVUd2 of the same VOB-D as line Pd1d shows, SML_AGL_C#1_DSTA which shows the relative address of angle-type interleave unit A-ILVUb2 of VOB-B as line Pd1b shows, And SML_AGL_C#2_DSTA which shows the relative address of next angle-type interleave unit A-ILVUc2 of VOB-C as line Pd1c shows is described.

[0329] Similarly, as line Pd2d, Pd2b, and Pd2c show to the nub pack NV of A-ILVUd2, following angle-type interleave unit A-ILVUd3 for every VOB, A-ILVUb3 and each relative address SML_AGL_C#3_DSTA of A-ILVUc3, SML_AGL_C#1_DSTA, and SML_AGL_C#2_DSTA are described. The relative address is described like description by VOB-B and VOB-C by the number of sectors from the nub pack NV of VOBU contained in each interleave unit.

[0330] In addition, since various kinds of parameters other than above-mentioned relative address SML_AGL_C#1_DSTA - SML_AGL_C#9_DSTA being entered in each nub pack NV is explanation ending with reference to drawing 20 , the explanation beyond this is omitted for facilitation.

[0331] About this address description, further, if it explains in full detail, address SML_AGL_C#1_DSTA of the nub pack NV of A-ILVUb2 refreshable next, address SML_AGL_C#2_DSTA of the nub pack NV of A-ILVUc2, and address SML_AGL_C#3_DSTA of the nub pack NV of A-ILVUd2 will be described by the nub pack NV of A-ILVUb1 in drawing at ILVU_EA and the list which are the end address of A-ILVUb1 self. Address SML_AGL_C#1_DSTA of the nub pack NV of A-ILVUb3 reproduced next in end address ILVU_EA of B-2 and a list, address SML_AGL_C#2_DSTA of the nub pack NV of A-ILVUc3, and address SML_AGL_C#3_DSTA of the nub pack NV of A-ILVUd3 are described by the nub pack NV of A-ILVUb2. In the nub pack NV of A-ILVUb3, or it is equivalent to the

termination information as the address of the nub pack NV of end address ILVU_EA of A-ILVUb3, and A-ILVU reproduced next, for example, NULL, (zero), parameters, such as "1", are altogether described as ILVU_EA. Also in VOB-C and VOB-D, it is the same.

[0332] Thus, since the address of A-ILVU reproduced behind in time can be predicted from the nub pack NV of each A-ILVU, it is suitable for the seamless playback reproduced continuously in time. Moreover, without taking into consideration the case where it does not change to the case where an angle type is changed, since A-ILVU of the following angle type in the same angle type is also described, the next jump address of the angle type chosen simply is obtained, and it can control by the same sequence jumped to the following interleave unit based on the address information.

[0333] thus, between each angle type -- setting -- the relative address of switchable A-ILVU -- describing -- and every -- the video encoding data contained in A-ILVU -- closed one -- since it consists of GOP(s), an image can be continuously reproduced at the time of the change of an angle type, without being confused.

[0334] Moreover, by each angle type, if voice is the same voice, it can reproduce continuously seamlessly the audio data which completed or became independent between each interleave unit ILVU like the above-mentioned. Furthermore, when the same audio data are completely recorded on each interleave unit ILVU, even if it changes over between each angle type and reproduces continuously, those who are hearing it do not even understand having changed.

[0335] On the other hand, the DS which realizes seamless data playback which allows discontinuity is explained to the contents of the information reproduced [which are reproduced and is seamless / un-/-information-reproduced] in an angle-type change using drawing 50 .

[0336] In drawing 50 , multi-angle-type data VOB-B consists of three video object units VOBUb1, VOBUb2, and VOBUb3. Similarly, VOB-C consists of three video object units VOBUc1, VOBUc2, and VOBUc3. Furthermore, VOB-D consists of three video object units VOBUd1, VOBUd2, and VOBUd3. Pack address VOBU_EA of the last of each VOBU is described by the nub pack NV of each video object unit VOBU like the example shown in drawing 49 . In addition, this pack address VOBU_EA is the address of the nub pack NV in VOBU which consists of one or more packs including the nub pack NV. deer ****** -- this example -- setting -- every -- to the nub pack NV of VOBU, the playback time of day of another angle type instead of the address of next VOBU changes in time, and address NSML_AGL_C#_DSTA of former VOBU is described.

[0337] That is, address NSML_AGL_C1_DSTA to NSML_AGL_C9_DSTA of VOBU of another angle type which synchronizes with the VOBU concerned is described. The figure of #1-#9 shows an angle-type number here, respectively. And the value which shows that an angle type does not exist in the field where the angle type

corresponding to the angle-type number does not exist, ″0″, is described. [for example,] That is, as line Pb1c 'and Pb1d' shows to the nub pack NV of the video object unit VOBUb1 of multi-angle-type data VOB-B, relative address NSML_AGL_C#2_DSTA-NSML_AGL_C#3_DSTA of VOBUc1 and VOBUd1 with which VOB-C 'and VOD-D' synchronized, respectively is described.

[0338] the same -- the nub pack NV of VOBUb2 -- line Pb2c -- ' -- it is shown -- as -- VOBUc2 -- and as line Pb2d' shows, relative address NSML_AGL_C#2_DSTA-NSML_AGL_C#3_DSTA of VOBUd2 is described. furthermore -- the nub pack NV of VOBUb3 -- line Pb3c -- ' -- it is shown -- as -- VOBUc3 -- and as line Pb3d' shows, relative address NSML_AGL_C#2_DSTA-NSML_AGL_C#3_DSTA of VOBUd3 is described.

[0339] Similarly Each VOBUc1 of VOB-C, the nub pack NV of VOBUc2 and VOBUc3, In each VOBUd1 of VOB-D, and the nub pack NV of VOBUd2 and VOBUd3 the inside of drawing -- line Pc1b -- ' -- Pc1d' and Pc2b -- ' -- Pc2d' -- Pc3b -- ' -- Relative address NSML_AGL_C#1_DSTA of VOBU shown by Pc3d', NSML_AGL_C#3_DSTA -- Pd1b -- ' -- Pd1c' and Pd2b -- ' -- Pd2c' and Pd3b -- ' -- and relative address NSML_AGL_C#1_DSTA of VOBU - NSML_AGL_C#2_DSTA which are shown by Pd3c' are described. Moreover, to the address information of the angle-type change-over corresponding to angle-type #3- angle-type #9 in which the angle type changed here does not exist, and NSML_AGL_C#4_DSTA-NSML_AGL_C#9_DSTA, since an angle type does not exist, the value which shows that an angle type does not exist in this field, ″0″, is described. [for example,]

[0340] To angle-type data with such DS, at the time of an angle-type change, data playback of VOBU of the angle type under playback is interrupted for a DVD decoder, and read-out of the data of VOBU of the changed angle type and playback are performed by it.

[0341] in addition, drawing 50 -- setting -- VOB-C -- VOB-D and VOB-B -- comparing -- time delay ****** -- although it looks like -- this -- every -- in order to make intelligible description relation of the address in the nub pack NV of VOB -- carrying out -- every -- it is the same as that of the example of drawing 49 between VOB(s) that there is nothing of a time lag.

[0342] thus, another VOBU which is originally coincidence in time as VOBU which was shown in drawing 50 , and which reproduces DS next -- or it is the example which describes VOBU before it. Therefore, when an angle-type change is performed, it will reproduce from a front scene (past) in time. In being the un-seamless information playback as which a continuity is not required of the information by which a seamless angle-type change is required that is, reproduced, the description approach of such address information is more suitable.

[0343] Flow chart: Explain the encoding information table which the encoding system control section 200 generates based on the above-mentioned scenario data St 7 with

reference to encoder drawing 27 . An encoding information table corresponds to the scene section which made the break the branch point and the joint of a scene, and consists of a VOB set data stream in which two or more VOB(s) are contained, and a VOB data stream which corresponds for every scene. The VOB set data stream shown in drawing 27 is explained in full detail behind.

[0344] It is the encoding information table created within the encoding system control section 200 based on the contents of a title which a user directs by step #100 of drawing 51 for multimedia stream generation of DVD. In the scenario of user directions, there is the branch point from a scene to two or more common scenes or a joint to a common scene. VwOB equivalent to the scene section which made its branch point and joint the break is considered as a VOB set, and the data created in order to encode a VOB set are made into the VOB set data stream. Moreover, by the VOB set data stream, when it includes the multi-scene section, the number of titles shown is shown in the number of titles of a VOB set data stream.

[0345] The VOB set DS of drawing 27 shows the contents of the data for encoding one VOB set of a VOB set data stream. VOB set DS A VOB set number (VOBS_NO), The VOB number (VOB_NO) in a VOB set, a precedence VOB seamless connection flag (VOB_Fsb), A consecutiveness VOB seamless connection flag (VOB_Fsf), a multi-scene flag (VOB_Fp), An interleave flag (VOB_Fi), a multi-angle type (VOB_Fm), It consists of a multi-angle-type seamless change flag (VOB_FsV), the maximum bit rate (ILV_BR) of Interleave VOB, the number of partitions (ILV_DIV) of Interleave VOB, and minimum interleave unit playback time amount (ILV_MT).

[0346] VOB set number VOBS_NO is a number for identifying the VOB set which attaches for example, the order of title scenario playback to a standard.

[0347] VOB number VOB_NO in a VOB set is a number for crossing for example, the order of title scenario playback to the whole title scenario at a standard, and identifying VOB.

[0348] Precedence VOB seamless connection flag VOB_Fsb is a flag which shows whether it connects with VOB of precedence seamlessly by scenario playback.

[0349] Consecutiveness VOB seamless connection flag VOB_Fsf is a flag which shows whether it connects with consecutive VOB seamlessly by scenario playback.

[0350] Multi-scene flag VOB_Fp is a flag which shows whether the VOB set consists of two or more VOB(s).

[0351] Interleave flag VOB_Fi is a flag which shows whether VOB in a VOB set carries out interleave arrangement.

[0352] Multi-angle-type flag VOB_Fm is a flag which shows whether a VOB set is a multi-angle type.

[0353] Multi-angle-type seamless change flag VOB_FsV is a flag which shows whether the change in a multi-angle type is seamless.

[0354] Interleave VOB maximum bit rate ILV_BR shows the value of the maximum bit

rate of VOB to interleave.

[0355] Interleave VOB number-of-partitions ILV_DIV shows the number of interleave units of VOB to interleave.

[0356] Minimum interleave unit playback time amount ILVU_MT shows the time amount which can be reproduced when the bit rate of VOB is ILV_BR in the minimum interleave unit in which a track buffer does not carry out an underflow at the time of interleave block playback.

[0357] The encoding information table which the encoding system control section 200 generates based on the above-mentioned scenario data St 7 with reference to drawing 28 and which corresponds for every VOB is explained. Based on this encoding information table, the encoding parameter data corresponding to each VOB mentioned later are generated to the video encoder 300, the subpicture encoder 500, the audio encoder 700, and the system encoder 900. The VOB data stream shown in drawing 28 is step #100 of drawing 51 , and is an encoding information table for every VOB created within encoding system control based on the contents of a title which a user directs for multimedia stream generation of DVD. One encoding unit is set to VOB and the data created in order to encode the VOB are made into the VOB data stream. For example, the VOB set which consists of three angle-type scenes will consist of three VOB(s). The VOB DS of drawing 28 shows the contents of the data for encoding one VOB of a VOB data stream.

[0358] VOB DS consists of a bit rate (A_BR) of the start time (VOB_VST) of a video material, the end time (VOB_VEND) of a video material, the class (VOB_V_KIND) of video material, the encoding bit rate (V_BR) of video, the start time (VOB_AST) of an audio material, the end time (VOB_AEND) of an audio material, an audio encoding method (VOB_A_KIND), and an audio.

[0359] Start time VOB_VST of a video material is the start time of video encoding corresponding to the time of day of a video material.

[0360] End time VOB_VEND of a video material is the end time of video encoding corresponding to the time of day of a video material.

[0361] Class VOB_V_KIND of a video material shows whether an encoding material is in any of the NTSC format or the PAL format, or a video material is a material by which telecine transform processing was carried out.

[0362] Bit rate V_BR of video is the encoding bit rate of video.

[0363] Start time VOB_AST of an audio material is the audio encoding start time corresponding to the time of day of an audio material.

[0364] End time VOB_AEND of an audio material is the audio encoding end time corresponding to the time of day of an audio material.

[0365] Audio encoding method VOB_A_KIND shows the encoding method of an audio, and there are an AC-3 method, an MPEG method, a linear PCM system, etc. in an encoding method.

[0366] Bit rate A_BR of an audio is the encoding bit rate of an audio.
[0367] The video for encoding VOB to drawing 29 , an audio, and the encoding parameter to each encoders 300, 500, and 900 of a system are shown. An encoding parameter A VOB number (VOB_NO), video encoding start time (V_STTM), Video encoding end time (V_ENDTM), encoding mode (V_ENCMD), A video encoding bit rate (V_RATE), the video encoding maximum bit rate (V_MRATE), A GOP structure fixed flag (GOP_FXflag), video encoding GOP structure (GOPST), A video encoding initial data (V_INTST), video encoding termination data (V_ENDST), Audio encoding start time (A_STTM), audio encoding end time (A_ENDTM), An audio encoding bit rate (A_RATE), an audio encoding method (A_ENCMD), It consists of a gap (A_ENDGAP), a precedence VOB number (B_VOB_NO), and a consecutiveness VOB number (F_VOB_NO) at the time of a gap (A_STGAP) and audio termination at the time of audio initiation.
[0368] VOB number VOB_NO -- for example, -- It is a number for identifying ********** and VOB for the order of title scenario playback over the whole title scenario to a standard.
[0369] Video encoding start time V_STTM is the video encoding start time on a video material.
[0370] Video encoding end time V_STTM is the video encoding end time on a video material.
[0371] Encoding mode V_ENCMD is in encoding mode for setting up whether reverse telecine transform processing is performed at the time of video encoding so that efficient encoding can be performed, when a video material is a material by which telecine conversion was carried out.
[0372] Video encoding bit rate V_RATE is an average bit rate at the time of video encoding.
[0373] V_MRATE of the video encoding maximum bit rate is the maximum bit rate at the time of video encoding.
[0374] GOP structure fixed flag GOP_FXflag shows whether it encodes without changing GOP structure on the way at the time of video encoding. It is an effective parameter when making it switchable seamlessly into a multi-angle-type scene.
[0375] The video encoding GOP structure GOPST is GOP structure data at the time of encoding.
[0376] Video encoding initial-data V_INST is an effective parameter when carrying out seamless playback with the video encoding stream of precedence which sets up the initial value of the VBV buffer at the time of video encoding initiation (decode buffer) etc.
[0377] Video encoding termination data V_ENDST sets up the exit value of the VBV buffer at the time of video encoding termination (decode buffer) etc. It is an effective parameter when carrying out seamless playback with a consecutive video encoding

stream.

[0378] Audio encoder start time A_STTM is the audio encoding start time on an audio material.

[0379] Audio encoder end time A_ENDTM is the audio encoding end time on an audio material.

[0380] Audio encoding bit rate A_RATE is a bit rate at the time of audio encoding.

[0381] Audio encoding method A_ENCMD is the encoding method of an audio, and has an AC-3 method, an MPEG method, a linear PCM system, etc.

[0382] Gap A_STGAP is the gap time amount of initiation of the video at the time of VOB initiation, and an audio at the time of audio initiation. It is an effective parameter when carrying out seamless playback with the system encoding stream of precedence.

[0383] Gap A_ENDGAP is the gap time amount of termination of the video at the time of VOB termination, and an audio at the time of audio termination. It is an effective parameter when carrying out seamless playback with a consecutive system encoding stream.

[0384] Precedence VOB number B_VOB_NO shows the VOB number, when the precedence VOB of seamless connection exists.

[0385] Consecutiveness VOB number F_VOB_NO shows the VOB number, when the consecutiveness VOB of seamless connection exists.

[0386] Actuation of the DVD encoder ECD concerning this invention is explained referring to the flow chart shown in drawing 51 . In addition, the block surrounded by the double line in this drawing shows a subroutine, respectively. Although a DVD system is explained, the authoring encoder EC can constitute this operation gestalt similarly that there is nothing until it says.

[0387] Step # In 100, a user inputs edit directions of the contents meeting a desired scenario, checking the contents of the multimedia source data St1, St2, and St3 in the edit information creation section 100. Step # By 200, the edit information creation section 100 generates the scenario data St 7 including above-mentioned edit directions information according to edit directions of a user. Step # The edit directions at the time of an interleave in the multi-angle type and the parental multi-scene section supposing interleaving among a user's contents of edit directions to the generate time of the scenario data St 7 of 200 are inputted so that the following conditions may be fulfilled.

[0388] The maximum bit rate of VOB from which image quality sufficient in image quality is acquired first is determined, and the amount of track buffers of the DVD decoder DCD further assumed as a regenerative apparatus of DVD encoding data and the jump engine performance, jump time amount, and the value of jump distance are determined. Based on the above-mentioned value, the playback time amount of the minimum interleave unit is acquired from a formula 3 and a formula 4.

[0389] Next, it verifies whether a formula 5 and a formula 6 are filled based on the

playback time amount of each scene contained at the multi-scene section. if not filled -- a consecutiveness scene part scene -- each scene connection of the multi-scene section -- it processes carrying out etc. and a formula 5 and a formula 6 are filled -- as -- a user -- the modification input of directions -- it carries out.

[0390] Furthermore, the playback time amount of each scene of an angle type and an audio input the edit directions made the same at the same time it fills a formula 7 at the time of a seamless change in edit directions of a multi-angle type. Moreover, at the time of an un-seamless change, a user inputs edit directions so that a formula 8 may be filled.

[0391] Step # By 300, the encoding system control section 200 judges first whether it is connecting an object scene seamlessly to a precedence scene based on the scenario data St 7. When seamless connection is the multi-scene section when the precedence scene section becomes from two or more scenes, one scene of the arbitration of all the scenes contained at the precedence multi-scene section is seamlessly connected with the common scene which is a candidate for connection at present. Similarly, when the scene for connection at present is the multi-scene section, it means saying that one scene of the arbitration of the multi-scene section is connectable. Step # By 300, when judged as NO, i.e., un-seamless connection, it progresses to step #400.

[0392] Step # By 400, the encoding system control section 200 resets precedence scene seamless connection flag VOB_Fsb which shows that seamless connection of the object scene is made with a precedence scene, and progresses to step #600. On the other hand, when it is judged by step #300 that seamless connection is made with YES, i.e., a precedence sheet, it progresses to step #500. Step # By 500, precedence scene seamless connection flag VOB_Fsb is set, and it progresses to step #600.

[0393] Step # By 600, the encoding system control section 200 judges whether it is making seamless connection with the scene which follows an object scene based on the scenario data St 7. Step # By 600, when judged as NO, i.e., un-seamless connection, it progresses to step #700.

[0394] Step # By 700, consecutiveness scene seamless connection flag VOB_Fsf which shows that the encoding system control section 200 makes seamless connection of the scene with a consecutiveness scene is reset, and it progresses to step #900. On the other hand, when it is judged by step #600 that seamless connection is made with YES, i.e., a consecutiveness sheet, it progresses to step #800.

[0395] Step # By 800, the encoding system control section 200 sets consecutiveness scene seamless connection flag VOB_Fsf, and progresses to step #900.

[0396] Step # By 900, the encoding system control section 200 judges whether the scene for connection is one or more, i.e., a multi-scene, based on the scenario data St 7. Switchable multi-angle-type control has the parental control and salvage pathway which reproduce only one salvage pathway among two or more salvage pathways

which can be constituted from a multi-scene in a multi-scene during the multi-scene section. By scenario step #900, it is judged that it is NO, i.e., non-multi scene connection, and it progresses to step #1000 at the time.

[0397] Step # By 1000, multi-scene flag VOB_Fp which shows that it is multi-scene connection is reset, and it progresses to encoding parameter generation step #1800. Step # Actuation of 1800 is described later.

[0398] On the other hand, by step #900, when judged as YES, i.e., multi-scene connection, it progresses to step #1100.

[0399] Step # By 1100, multi-scene flag VOB_Fp is set and it progresses to step #1200 which judge whether it is multi-angle-type connection.

[0400] Step # By 1200, it judges whether it is the section of whether the change between two or more scenes in the multi-scene section is carried out, and a multi-angle type. Step # When it is judged as the parental control which reproduces only one salvage pathway by 1200, without changing in the middle of NO, i.e., the multi-scene section, it progresses to step #1300.

[0401] Step # By 1300, being [the scene for connection / a multi-angle type] **** multi-angle-type flag VOB_Fm is reset, and it progresses to step #1302.

[0402] Step # By 1302, it judges whether it is set any of precedence scene seamless connection flag VOB_Fsb and consecutiveness scene seamless connection flag VOB_Fsf they are. Step # When it is judged by 1300 that YES, i.e., the scene for connection, makes seamless connection with either of the scenes of precedence or consecutiveness or both, it progresses to step #1304.

[0403] Step # In 1304, interleave flag VOB_Fi which shows that VOB which is encoding data of an object scene is interleaved is set, and it progresses to step #1800.

[0404] On the other hand, by step #1302, NO, i.e., an object scene, progresses to step #1306, in making seamless connection with neither a precedence scene nor a consecutiveness scene.

[0405] Step # Interleave flag VOB_Fi is reset by 1306 and it progresses to step #1800.

[0406] On the other hand, when it is judged by step #1200 that it is YES, i.e., a multi-angle type, it progresses to step #1400.

[0407] Step # In 1400, it progresses to step #1500, after setting multi-angle-type flag VOB_Fm and interleave flag VOB_Fi.

[0408] Step # By 1500, the encoding system control section 200 judges whether so-called it changes seamlessly, without being the multi-angle-type scene section, that is, being a playback unit smaller than VOB, and breaking off an image and an audio based on the scenario data St 7. Step # By 1500, when judged as NO, i.e., an un-seamless change, it progresses to step #1600.

[0409] Step # By 1600, seamless change flag VOB_FsV which shows that an object scene is a seamless change is reset, and it progresses to step #1800.

[0410] On the other hand, when judged as step #1500 and YES, i.e., a seamless change,

it progresses to step #1700.

[0411] Step # By 1700, seamless change flag VOB_FsV is set and it progresses to step #1800. Thus, in this invention, from the scenario data St 7 reflecting an edit intention, edit information is detected as a set condition of each above-mentioned flag, and progresses to step #1800 behind.

[0412] Step # The encoding parameter in the VOB data unit indicated to be information addition on the encoding information table for every VOB set unit shown in drawing 27 and drawing 28 , respectively and VOB unit in order to encode a source stream by 1800 based on a user's edit intention detected as a set condition of each flag like **** to drawing 29 is created. Next, it progresses to step #1900.

[0413] The detail of this encoding parameter creation step is explained later with reference to drawing 52 , drawing 53 , drawing 54 , and drawing 55 .

[0414] Step # It progresses to step #2000, after creating by step #1800 and performing encoding of a video data and audio data by 1900 based on an encoding parameter. In addition, originally the continuity with the scene of the purpose which originally inserts subpicture data at any time during video recovery if needed, and is used to order etc. is needlessness. Furthermore, since a subpicture is the image information for one screen about, unlike the video data and audio data which extend on a time-axis, there are many cases of quiescence and they always are not continuously reproduced by the display top. Therefore, in this operation gestalt about the continuation playback referred to as seamless and un-seamless, explanation is omitted about encoding of subpicture data for facilitation.

[0415] the loop formation by which only the number of VOB sets is constituted from each step from step #300 to step #1900 step #2000 -- turning -- every of the title of drawing 16 -- the program chain (VTS_PGC#I) information which has playback information, such as the order of playback of VOB, in own DS is formatted, VOB of the mull CHIRUCHI scene section is created, and a VOB set data stream required in order to carry out system encoding of the interleave arrangement, and a VOB data stream are completed. Next, it progresses to step #2100.

[0416] Step # It progresses to step #2200, after obtaining all VOB number-of-sets VOBS_NUM obtained as a result of the loop formation to step #2000, adding to a VOB set data stream, setting up number TITLE_NO of titles at the time of making the number of scenario salvage pathways into the number of titles in the scenario data St 7 further and completing the VOB set data stream as an encoding information table by 2100.

[0417] Step # By 2200, system encoding for creating the VOB (VOB#i) data in VTSTT_VOBS of drawing 16 is performed based on the video encoding stream encoded by step #1900, an audio encoding stream, and the encoding parameter of drawing 29 . Next, it progresses to step #2300.

[0418] Step # The format which includes in the data origination and the multi-scene

section of program chain information (VTS_PGCI#I) which control the order of playback of the VTS information on drawing 16 , the VTSI managed table (VTSI_MAT) contained in VTSI, a VTSPGC information table (VTSPGCIT), and VOB data by 2300, and includes processing of interleave arrangement of **** VOB etc. is performed.

[0419] The detail of this format step is explained later with reference to drawing 56 , drawing 57 , drawing 58 , drawing 59 , and drawing 60 .

[0420] With reference to drawing 52 , drawing 53 , and drawing 54 , actuation of the encoding parameter generation at the time of the multi-angle-type control in the encoding parameter generation subroutine of step #1800 of the flow chart shown in drawing 51 is explained.

[0421] First, when it is judged as NO by step #1500 of drawing 51 with reference to drawing 52 that is, each flag explains encoding parameter generation actuation of the un-seamless change stream at the time of multi-angle-type control, when it is VOB_Fsb=1 or VOB_Fsf=1, VOB_Fp=1, VOB_Fi=1, VOB_Fm=1, and FsV=0, respectively. The encoding parameter shown in drawing 27 , the encoding information table shown in drawing 28 , and drawing 29 in the following actuation is created.

[0422] Step # In 1812, the order of scenario playback contained in the scenario data St 7 is extracted, VOB set number VOBS_NO is set up, and VOB number VOB_NO is further set up to one or more VOB(s) in a VOB set.

[0423] Step # In 1814, maximum bit rate ILV_BR of Interleave VOB is set as video encoding maximum bit rate V_MRATE of an encoding parameter based on an extract and interleave flag VOB_Fi=1 from the scenario data St 7.

[0424] Step # In 1816, minimum interleave unit playback time amount ILVU_MT is extracted from the scenario data St 7.

[0425] Step # In 1818, it is set as the value of N= 15 of the video encoding GOP structure GOPST, and M= 3, and GOP structure fixed flag GOPFXflag="1" based on multi-angle-type flag VOB_Fp=1.

[0426] Step # 1820 is the common routine of a VOB data setup. The VOB data common setting routine of step #1820 is shown in drawing 53 . The encoding parameter shown in drawing 27 , the encoding information table shown in drawing 28 , and drawing 29 by the following flows of operation is created.

[0427] Step # In 1822, from the scenario data St 7, start time VOB_VST of each video material of VOB and end time VOB_VEND are extracted, and let video encoding start time V_STTM and encoding end time V_ENDTM be the parameters of video encoding.

[0428] Step # In 1824, from the scenario data St 7, start time VOB_AST of each audio material of VOB is extracted, and let audio encoding start time A_STTM be the parameter of audio encoding.

[0429] step #1826 -- the scenario data St 7 -- every -- end time VOB_AEND of the audio material of VOB is extracted, and time of day of a texture **** audio access unit (it is described as Following AAU) unit is made into encoding end time A_ENDTM

which is the parameter of audio encoding with an audio encoding method at the time of day which does not exceed VOB_AEND.

[0430] Step # 1828 is taken as the parameter of system encoding of gap A_STGAP at the time [difference / of video encoding start time V_STTM and audio encoding start time A_STTM] of audio initiation.

[0431] Step # Let gap A_ENDGAP be the parameter of system encoding in 1830 at the time [difference / of video encoding end time V_ENDTM and audio encoding end time A_ENDTM] of audio termination.

[0432] Step # In 1832, from the scenario data St 7, bit rate V_BR of video is extracted and let video encoding bit rate V_RATE be the parameter of video encoding as an average bit rate of video encoding.

[0433] Step # In 1834, from the scenario data St 7, bit rate A_BR of an audio is extracted and let audio encoding bit rate A_RATE be the parameter of audio encoding.

[0434] Step # In 1836, class VOB_V_KIND of a video material is extracted from the scenario data St 7, and if it is a film material, i.e., the material by which telecine conversion was carried out, reverse telecine conversion will be set as video encoding mode V_ENCMD, and it will consider as the parameter of video encoding.

[0435] Step # In 1838, from the scenario data St 7, encoding method VOB_A_KIND of an audio is extracted, an encoding method is set as audio encoding mode A_ENCMD, and it considers as the parameter of audio encoding. Step # In 1840, the VBV buffer initial value of video encoding initial-data V_INST sets up so that it may become a value below the VBV buffer exit value of video encoding termination data V_ENDST, and it considers as the parameter of video encoding.

[0436] step #1842 -- Precedence VOB -- seamless -- based on connection flag VOB_Fsb=1, it is set as VOB number B_VOB_NO of precedence connection of VOB number VOB_NO of precedence connection, and considers as the parameter of system encoding.

[0437] step #1844 -- consecutiveness VOB -- seamless -- based on connection flag VOB_Fsf=1, it is set as VOB number F_VOB_NO of consecutiveness connection of VOB number VOB_NO of consecutiveness connection, and considers as the parameter of system encoding.

[0438] As mentioned above, it is the VOB set of a multi-angle type, and the encoding information table and encoding parameter of a case of control of an un-seamless multi-angle-type change can be generated.

[0439] Next, when it is judged as Yes by step #1500 in drawing 51 with reference to drawing 54 that is, each flag explains encoding parameter generation actuation of the seamless change stream at the time of multi-angle-type control in the case of being VOB_Fsb=1 or VOB_Fsf=1, VOB_Fp=1, VOB_Fi=1, VOB_Fm=1, and VOB_FsV=1, respectively.

[0440] The encoding parameter shown in drawing 27 , the encoding information table

shown in drawing 28 , and drawing 29 in the following actuation is created.

[0441] Step # In 1850, the order of scenario playback contained in the scenario data St 7 is extracted, VOB set number VOBS_NO is set up, and VOB number VOB_NO is further set up to one or more VOB(s) in a VOB set.

[0442] Step # In 1852, maximum bit rate ** LV_BR of Interleave VOB is set as video encoding maximum bit rate V_RATE based on an extract and interleave flag VOB_Fi=1 from the scenario data St 7.

[0443] Step # In 1854, minimum interleave unit playback time amount ILVU_MT is extracted from the scenario data St 7.

[0444] Step # In 1856, it is set as the value of N= 15 of the video encoding GOP structure GOPST, and M= 3, and GOP structure fixed flag GOPFXflag="1" based on multi-angle-type flag VOB_Fp=1.

[0445] seamless at step #1858 -- change flag VOB_FsV=1 -- being based -- the video encoding GOP structure GOPST -- closed one -- let GOP be the parameter of a setup and video encoding.

[0446] Step # 1860 is the common routine of a VOB data setup. This common routine is a routine shown in drawing 52 , and since it has already explained, it is omitted.

[0447] The encoding parameter in seamless change control is generable as mentioned above with the VOB set of a multi-angle type.

[0448] Next, when it is judged as NO by step #1200 and judged as YES at step 1304 in drawing 51 with reference to drawing 55 that is, each flag explains the encoding parameter generation actuation at the time of parental control in the case of being VOB_Fsb=1 or VOB_Fsf=1, VOB_Fp=1, VOB_Fi=1, and VOB_Fm=0, respectively. The encoding parameter shown in drawing 27 , the encoding information table shown in drawing 28 , and drawing 29 in the following actuation is created.

[0449] Step # In 1870, the order of scenario playback contained in the scenario data St 7 is extracted, VOB set number VOBS_NO is set up, and VOB number VOB_NO is further set up to one or more VOB(s) in a VOB set.

[0450] Step # In 1872, maximum bit rate ILV_BR of Interleave VOB is set as video encoding maximum bit rate V_RATE based on an extract and interleave flag VOB_Fi=1 from the scenario data St 7.

[0451] Step # In 1874, VOB interleave unit number-of-partitions ILV_DIV is extracted from the scenario data St 7.

[0452] Step # 1876 is the common routine of a VOB data setup. This common routine is a routine shown in drawing 52 , and since it has already explained, it is omitted.

[0453] The encoding parameter in parental control by the VOB set of a multi-scene is generable as mentioned above.

[0454] Next, when it is judged as NO by step #900 in drawing 51 with reference to drawing 61 that is, each flag explains in the case of being VOB_Fp=0, i.e., encoding parameter generation actuation of a single scene, respectively. The encoding

parameter shown in drawing 27 , the encoding information table shown in drawing 28 , and drawing 29 in the following actuation is created.

[0455] Step # In 1880, the order of scenario playback contained in the scenario data St 7 is extracted, VOB set number VOBS_NO is set up, and VOB number VOB_NO is further set up to one or more VOB(s) in a VOB set.

[0456] Step # In 1882, maximum bit rate ILV_BR of Interleave VOB is set as video encoding maximum bit rate V_MRATE based on an extract and interleave flag VOB_Fi=1 from the scenario data St 7.

[0457] Step # 1884 is the common routine of a VOB data setup. This common routine is a routine shown in drawing 52 , and since it has already explained, it is omitted.

[0458] the above -- the encoding parameter for the formatter of the video of DVD, an audio, system encoding, and DVD is generable with encoding information table creation [like] and an encoding parameter creation flow.

[0459] The actuation in the formatter subroutine of the DVD multimedia stream generation of step #2300 shown in drawing 51 is explained to formatter flow drawing 56 , drawing 57 , drawing 58 , drawing 59 , and drawing 60 .

[0460] Actuation of the formatter 1100 of the DVD encoder ECD concerning this invention is explained referring to the flow chart shown in drawing 56. In addition, the block surrounded by the double line in this drawing shows a subroutine, respectively.

[0461] Step # In 2310, VTSI_PGCI for several TITLE_NUM minutes is set as video title set managed table VTSI_MAT in VTSI based on number TITLE_NUM of titles of a VOB set data stream.

[0462] Step # In 2312, it judges whether it is a multi-scene based on multi-scene flag VOB_Fp in VOB set data. Step # When it is judged that it is not NO, i.e., a multi-scene, in 2112, it progresses to step #2114.

[0463] Step # 2314 shows the subroutine of actuation of the formatter 1100 in the author rig encoder of single drawing 25 of VOB. About this subroutine, it mentions later.

[0464] Step # In 2312, when it is judged that it is YES, i.e., a multi-scene, it progresses to step #2316. Step # In 2316, it judges whether it interleaves or not based on interleave flag VOB_Fi in VOB set data. Step # By 2316, NO, i.e., when it is judged that it does not interleave, it progresses to step #2314.

[0465] Based on multi-angle-type flag VOB_Fm in VOB set data at step 2318, it judges whether it is a multi-angle type. when it was judged as NO that is, by step #2318 and is judged as 7s ** by the multi-angle type, it progresses to step #2320 which are the subroutine of parental control.

[0466] Step # 2320 shows the subroutine of formatter actuation with the VOB set of parental control. This subroutine is shown in drawing 59 and explained to a detail later.

[0467] Step # In 2320, when [which is YES, i.e. a multi-angle type] judged, it progresses to step #2322.

[0468] Step # In 2322, it judges whether it is a seamless change based on multi-angle-type seamless change flag VOB_FsV. Step # When NO, i.e., a multi-angle type, is judged to be un-seamless change control by 2322, it progresses to step #2326.
[0469] Step # 2326 shows the subroutine of actuation of the formatter 1100 of authoring encoding of drawing 25 in the case of the multi-angle type of un-seamless change control. It explains to a detail later using drawing 57 .
[0470] Step # In 2322, when it is judged that it is the multi-angle type of YES, i.e., seamless change control, it progresses to step #2324.
[0471] Step # 2324 shows the subroutine of actuation of the formatter 1100 of the multi-angle type of seamless change control. It explains to a detail later using drawing 58 .
[0472] At step 2328, the cel playback information CPBI set up by the previous flow is recorded as CPBI information on VTSI.
[0473] Step # In 2330, it judges whether processing of the VOB set of a part which the formatter flow showed by VOB number-of-sets VOBS_NUM of a VOB set data stream was completed. Step # In 2130, if no processing of NO, i.e., VOB sets, is completed, it progresses to step #2112. Step # In 2130, if processing of YES, i.e., all VOB sets, is completed, processing will be ended.
[0474] Next, in step #2322 of drawing 56 , the subroutine of subroutine step #2326 when NO, i.e., a multi-angle type, is judged to be un-seamless change control is explained using drawing 57 . The information in the nub pack NV shown in the contents and drawing 20 of the cel playback information (C_PBI#i) shown by interleave arrangement and drawing 16 of a multimedia stream by the flow of operation shown below is recorded on the multimedia stream of generated DVD.
[0475] Step # It is based on the information on VOB_Fm=1 which shows that the multi-scene section performs multi-angle-type control by 2340. In the cell block mode (CBM in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene For example, CBM= "cell block head =01b" of the cel of MA1 shown in drawing 23 , CBM= "inside [of a cell block] =10b" of the cel of MA2, and CBM= "last =11b of a cell block" of the cel of MA3 are recorded.
[0476] the cell block type (CBT in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene based on the information on VOB_Fm=1 which shows that the multi-scene section performs multi-angle-type control by step #2342 -- "an angle type" -- shown value = "01b" is recorded.
[0477] Step # In 2344, "1" is recorded on the seamless playback flag (SPF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.

[0478] Step # In 2346, "1" is recorded on the STC resetting flag (STCDF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.
[0479] Step # In 2348, "1" is recorded on the interleave block location flag (IAF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_FsV=1 which shows that it is an interleave important point.
[0480] Step # The title edit unit acquired from the system encoder 900 of drawing 25 in 2350 The positional information (the number of relative sectors from a VOB head) of the nub pack NV (hereafter described to be VOB) is detected. The nub pack NV is detected based on the data of playback time amount ILVU_MT of the minimum interleave unit which is the parameter of the formatter obtained by step #1816 of drawing 51 . The positional information (the number of sectors from the head of VOB etc.) of VOBU is acquired, and it divides per VOBU. For example, in the above-mentioned example, for 2 seconds, since the minimum interleave unit playback time amount is playback time amount 0.5 seconds of one VOBU, it is divided as an interleave unit for every 4VOBU. This division processing is performed to VOB equivalent to each multi-scene.
[0481] Step # in 2352, as control information of VOB corresponding to each scene recorded by step #2140 the described order (a "cell block head" --) of cell block mode (CBM in drawing 16) description It follows in order of the description made into "the last of a cell block" "among cell blocks." For example, each interleave unit of VOB obtained by step #2350 is arranged in order of the cel of MA1 shown in drawing 23 , the cel of MA2, and the cel of MA3, an interleave block as shown by drawing 37 or drawing 38 is formed, and it adds to VTSTT_VOB data.
[0482] Step # In 2354, the number of relative sectors from a VOBU head is recorded on the VOBU last pack address (COBU_EA of drawing 20) of the nub pack NV of each VOBU based on the positional information of VOBU obtained by step #2350.
[0483] Step # In 2356, cel head VOBU address C_FVOBU_SA and cel termination VOBU address C_LVOBU_SA are recorded for the number of sectors from the head of VTSTT_VOBS based on the VTSTT_VOBS data obtained by step #2352 as the address of the nub pack NV of VOBU of the head of each cel, and the address of the nub pack NV of the last VOBU.
[0484] Step # In 2358, the number of relative sectors within the data of the interleave block formed by step #2352 is recorded on the un-seamless angle-type information on the nub pack NV of each VOBU (NSM_AGLI of drawing 20) in an angle-type #iVOBU starting address (NSML_AGL_C1_DSTA of drawing 20 - NSML_AGL_C9_DSTA) as positional information (drawing 50) of the nub pack NV included in VOBU of all angle-type scenes near the playback start time of the VOBU.

[0485] Step # In 2160, in VOBU obtained by step #2350, if it is the last VOBU of each scene of the multi-scene section, "7FFFFFFFh" will be recorded on the angle-type #iVOBU starting address (NSML_AGL_C1_DSTA of drawing 20 - NSML_AGL_C9_DSTA) of the un-seamless angle-type information on the nub pack NV of the VOBU (NSM_AGLI of drawing 20).

[0486] The control information in the cel which is the playback control information which is equivalent to the interleave block equivalent to un-seamless change multi-angle-type control of the multi-scene section and its multi-scene with the above step is formatted.

[0487] Next, in step #2322 of drawing 56 , subroutine step #2324 when YES, i.e., a multi-angle type, is judged to be seamless change control are explained using drawing 58 . The information in the nub pack NV shown in the contents and drawing 20 of the cel playback information (C_PBI#i) shown by interleave arrangement and drawing 16 of a multimedia stream by the flow of operation shown below is recorded on the multimedia stream of generated DVD.

[0488] Step # It is based on the information on VOB_Fm=1 which shows that the multi-scene section performs multi-angle-type control by 2370. In the cell block mode (CBM in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene For example, CBM= "cell block head =01b" of the cel of MA1 shown in drawing 23 , CBM= "inside [of a cell block] =10b" of the cel of MA2, and CBM= "last =11b of a cell block" of the cel of MA3 are recorded.

[0489] the cell block type (CBT in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene based on the information on VOB_Fm=1 which shows that the multi-scene section performs multi-angle-type control by step #2372 -- "an angle type" -- shown value = "01b" is recorded.

[0490] Step # In 2374, "1" is recorded on the seamless playback flag (SPF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.

[0491] Step # In 2376, "1" is recorded on the STC resetting flag (STCDF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.

[0492] Step # In 2378, "1" is recorded on the interleave block location flag (IAF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_FsV=1 which shows that it is an interleave important point.

[0493] Step # The title edit unit acquired from the system encoder 900 of drawing 25

in 2380 The positional information (the number of relative sectors from a VOB head) of the nub pack NV (hereafter described to be VOB) is detected. The nub pack NV is detected based on the data of playback time amount ILVU_MT of the minimum interleave unit which is the parameter of the formatter obtained by step #1854 of drawing 53 . The positional information (the number of sectors from the head of VOB etc.) of VOBU is acquired, and it divides per VOBU. For example, in the above-mentioned example, for 2 seconds, since the minimum interleave unit playback time amount is playback time amount 0.5 seconds of one VOBU, it is divided as an interleave unit for every 4VOBU units. This division processing is performed to VOB equivalent to each multi-scene.

[0494] Step # in 2382, as control information of VOB corresponding to each scene recorded by step #2160 the described order (a "cell block head" --) of cell block mode (CBM in drawing 16) description It follows in order of and the description made into "the last of a cell block" "among cell blocks." For example, each interleave unit of VOB obtained by step #1852 is arranged in order of the cel of MA1 shown in drawing 23 , the cel of MA2, and the cel of MA3, an interleave block as shown by drawing 37 or drawing 38 is formed, and it adds to VTSTT_VOBS data.

[0495] Step # In 2384, the number of relative sectors from a VOBU head is recorded on the VOBU last pack address (COBU_EA of drawing 20) of the nub pack NV of each VOBU based on the positional information of VOBU obtained by step #2360.

[0496] Step # In 2386, cel head VOBU address C_FVOBU_SA and cel termination VOBU address C_LVOBU_SA are recorded for the number of sectors from the head of VTSTT_VOBS based on the VTSTT_VOBS data obtained by step #2382 as the address of the nub pack NV of VOBU of the head of each cel, and the address of the nub pack NV of the last VOBU.

[0497] each which constitutes the interleave unit from step #2388 based on the data of the interleave unit obtained by step #2370 -- the number of relative sectors to the pack of the last of an interleave unit is recorded on the interleave unit last pack address (the ILVU last pack address) (ILVU_EA of drawing 20) of the nub pack NV of VOBU.

[0498] Step # In 2390, to the seamless angle-type information on the nub pack NV of each VOBU (SML_AGLI of drawing 20) As positional information (drawing 50) of the nub pack NV with the start time following the playback end time of the VOBU included in VOBU of all angle-type scenes Step # The number of relative sectors within the data of the interleave block formed by 2382 is recorded on an angle-type #iVOBU starting address (SML_AGL_C1_DSTA of drawing 20 - SML_AGL_C9_DSTA).

[0499] Step # In 2392, if the interleave unit arranged by step #2382 is an interleave unit of the last of each scene of the multi-scene section, "FFFFFFFFh" will be recorded on the angle-type #iVOBU starting address (SML_AGL_C1_DSTA of drawing 20 - SML_AGL_C9_DSTA) of the seamless angle-type information on the nub pack NV

of VOBU contained in the interleave unit (SML_AGLI of drawing 20).

[0500] It means that the control information in the cel which is the playback control information which is equivalent to the interleave block equivalent to seamless change multi-angle-type control of the multi-scene section and its multi-scene with the above step was formatted.

[0501] Next, in step #2318 of drawing 56 , subroutine step #2320 when it is judged that it is not NO, i.e., a multi-angle type, but parental control are explained using drawing 59 . The information in the nub pack NV shown in the contents and drawing 20 of the cel playback information (C_PBI#i) shown by interleave arrangement and drawing 16 of a multimedia stream by the flow of operation shown below is recorded on the multimedia stream of generated DVD.

[0502] Step # In 2402, the multi-scene section records "00b" on the cell block mode (CBM in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene based on the information on VOB_Fm=0 which shows not performing multi-angle-type control.

[0503] Step # In 2404, "1" is recorded on the seamless playback flag (SPF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.

[0504] Step # In 2406, "1" is recorded on the STC resetting flag (STCDF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.

[0505] Step # In 2408, "1" is recorded on the interleave block location flag (IAF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_FsV=1 which shows that it is an interleave important point.

[0506] Step # The title edit unit acquired from the system encoder 900 of drawing 25 in 2410 The positional information (the number of relative sectors from a VOB head) of the nub pack NV (hereafter described to be VOB) is detected. The nub pack NV is detected based on the data of VOB interleave number-of-partitions ILV_DIV which is the parameter of the formatter obtained by step #1874 of drawing 55 . The positional information (the number of sectors from the head of VOB etc.) of VOBU is acquired, and it divides into the interleave unit of the number of partitions which had VOB set up per VOBU.

[0507] Step # In 2412, the interleave unit obtained by step #2410 is arranged by turns. For example, it arranges in ascending order of a VOB number, an interleave block as shown by drawing 37 or drawing 38 is formed in it, and it adds to it at VTSTT_VOBS.

[0508] Step # In 2414, the number of relative sectors from a VOBU head is recorded on the VOBU last pack address (COBU_EA of drawing 20) of the nub pack NV of each

VOBU based on the positional information of VOBU obtained by step #2186.
[0509] Step # In 2416, cel head VOBU address C_FVOBU_SA and cel termination VOBU address C_LVOBU_SA are recorded for the number of sectors from the head of VTSTT_VOBS based on the VTSTT_VOBS data obtained by step #2412 as the address of the nub pack NV of VOBU of the head of each cel, and the address of the nub pack NV of the last VOBU.
[0510] each which constitutes the interleave unit from step #2418 based on the data of the arranged interleave unit which was obtained by step #2412 -- the number of relative sectors to the pack of the last of an interleave unit is recorded on the interleave unit last pack address (the ILVU last pack address) (ILVU_EA of drawing 20) of the nub pack NV of VOBU.
[0511] Step # In 2420, interleave [degree] unit start-address NT_ILVU_SA is recorded for the number of relative sectors within the data of the interleave block formed by step #2412 on the nub pack NV of VOBU contained in the interleave unit ILVU as positional information of the next ILVU.
[0512] Step # In 2422, "1" is recorded on the nub pack NV of VOBU contained in the interleave unit ILVU at the ILVU flag ILVUflag.
[0513] Step # In 2424, "1" is recorded on the UnitEND flag UnitENDflag of the nub pack NV of VOBU of the last in the interleave unit ILVU.
[0514] Step # In 2426, "FFFFFFFFh" is recorded on interleave [degree] unit start-address NT_ILVU_SA of the nub pack NV of VOBU in the interleave unit ILVU of each last of VOB.
[0515] The control information in the cel which is the cel playback control information which is equivalent to the interleave block equivalent to parental control of the multi-scene section and its multi-scene with the above step is formatted.
[0516] Next, in step #2312 of drawing 56 , and step #2316, subroutine step #2314 when it is judged that it is not NO, i.e., a multi-scene, but a single scene are explained using drawing 60 . The information in the nub pack NV shown in the contents and drawing 20 of the cel playback information (C_PBI#i) shown by interleave arrangement and drawing 16 of a multimedia stream by the flow of operation shown below is recorded on the multimedia stream of generated DVD.
[0517] Step # In 2430, "00b" which shows that it is a non-cell block is recorded on the cell block mode (CBM in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to each scene based on the information on VOB_Fp=0 which shows that it is not the multi-scene section but the single scene section.
[0518] Step # In 2432, "0" is recorded on the interleave block location flag (IAF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_FsV=0 which shows that it is interleave needlessness.

[0519] Step # In 2434, from the title edit unit (it is hereafter described as VOB) acquired from the system encoder 900 of drawing 25 , the positional information (the number of relative sectors from a VOB head) of the nub pack NV is detected, and it arranges per VOBU, and adds to VTSTT_VOB which is stream data, such as video of a multimedia clue stream.
[0520] Step # In 2436, the number of relative sectors from a VOBU head is recorded on the VOBU last pack address (COBU_EA of drawing 20) of the nub pack NV of each VOBU based on the positional information of VOBU obtained by step #2434.
[0521] Step # In 2438, the address of the nub pack NV of VOBU of the head of each cel and the address of the nub pack NV of the last VOBU are extracted based on the VTSTT_VOBS data obtained by step #2434. Furthermore, the number of sectors from the head of VTSTT_VOBS is recorded as cel head VOBU address C_FVOBU_SA, and the number of sectors from the termination of VTSTT_VOBS is recorded as cel termination VOBU address C_LVOBU_SA.
[0522] Step # It judges whether it is in the judged condition, VOB_Fsb=1 [i.e.,] which show the scene of order, and seamless connection, by step #300 of drawing 51 , or step #600 2440. Step # When judged as YES by 2440, it progresses to step #2442.
[0523] Step # In 2442, "1" is recorded on the seamless playback flag (SPF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.
[0524] Step # In 2444, "1" is recorded on the STC resetting flag (STCDF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=1 which shows making seamless connection.
[0525] Step # When judged as NO by 2440 (i.e., when not making seamless connection with a front scene), it progresses to step #2446.
[0526] Step # In 2446, "0" is recorded on the seamless playback flag (SPF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=0 which shows making seamless connection.
[0527] Step # In 2448, "0" is recorded on the STC resetting flag (STCDF in drawing 16) of the cel (C_PBI#i of drawing 16) which describes the control information of VOB corresponding to a scene based on the information on VOB_Fsb=0 which shows making seamless connection.
[0528] The information in the nub pack NV shown in the contents and drawing 20 of the cel playback information (C_PBI#i) shown by the flow of operation shown above by arrangement and drawing 16 of the multimedia stream equivalent to the single scene section is recorded on the multimedia stream of generated DVD.
[0529] The decoding information table which the decoding system control section

2300 generates from the flow chart disk of a decoder with reference to drawing 62 and drawing 63 based on scenario select data St51 below to a stream buffer transfer flow is explained. A decoding information table consists of a decoding system table shown in drawing 62 , and a decoding table shown in drawing 63 .

[0530] As shown in drawing 62 , a decoding system table consists of the scenario information register section and the cel information register section. The scenario information register section extracts and records playback scenario information, such as a title number which the user contained in scenario select data St51 chose. The scenario information register section extracts information required for playback for each cel information which constitutes a program chain based on the scenario information which the extracted user chose, and the cel information register section records it.

[0531] Furthermore, the scenario information register section contains angle-type number register ANGLE_NO_reg, VTS number register VTS_NO_reg, PGC number register VTS_PGCI_NO_reg, audio ID register AUDIO_ID_reg, subimage ID register SP_ID_reg, and buffer register SCR_buffer for SCR.

[0532] Angle-type number register ANGLE_NO_reg records the information on which angle type is reproduced, when a multi-angle type exists in PGC to reproduce. VTS number register VTS_NO_reg records the number of VTS reproduced next among two or more VTS(s) which exist on a disk. PGC number register VTS_PGCI_NO_reg records the information which directs which PGC is reproduced among two or more PGC(s) which exist among VTS for applications, such as parental one.

[0533] Audio ID register AUDIO_ID_reg records the information which directs which [of two or more audio streams which exist among VTS] is reproduced. Subimage ID register SP_ID_reg records which subimage stream is reproduced and the information to direct, when two or more subimage streams exist in VTS. Buffer SCR_buffer for SCR is a buffer which stores temporarily SCR described by the pack header, as shown in drawing 19 . This SCR stored temporarily is outputted to the decoding system control section 2300 as in-stream playback data St 63, as explained with reference to drawing 26 .

[0534] The cel information register section contains cell block mode register CBM_reg, cell block type register CBT_reg, seamless playback flag register SPB_reg, interleave allocation flag register IAF_reg, STC resetting flag register STCDF_reg, seamless angle-type change flag register SACF_reg, VOBU initiation address register C_FVOBU_SA_reg of the cel beginning, and VOBU initiation address register C_LVOBU_SA_reg of the cel last.

[0535] Cell block mode register CBM_reg shows whether two or more cels constitute one functional block, and when not constituted, it records "N_BLOCK" as a value. Moreover, when the cel constitutes one functional block, in the case of the cel of the head of the functional block, in the case of the last cel, "BLOCK" is recorded

["F_CELL"] for "L_CELL" as a value in the case of a cel in the meantime.

[0536] Cell block type register CBT_reg is a register which records the class of block shown by cell block mode register CBM_reg, and, in the case of a multi-angle type, is. "N_BLOCK" is recorded when it is not a multi-angle type about "A_BLOCK".

[0537] Seamless playback flag register SPF_reg records the information which shows whether this cel connects with the cel or cell block reproduced in front seamlessly, and is reproduced. In connecting with a front cel or a front cell block seamlessly and reproducing, when it is not seamless connection about "SML", it records "NSML" as a value as a value.

[0538] Interleave allocation flag register IAF_reg records the information on whether this cel is arranged to the interleave field. "N_ILVB" is recorded, when are arranged to the interleave field and "ILVB" is not arranged to an interleave field as a value.

[0539] STC resetting flag register STCDF_reg records the information on whether it is necessary to reset STC (System Time Clock) used in case a synchronization is taken at the time of playback of a cel or, and whether there is nothing. When resetting is required, "STC_RESET" is recorded as a value, and when resetting is unnecessary, "STC_NRESET" is recorded as a value.

[0540] This cel belongs to the angle-type section, and seamless angle-type change flag register SACF_reg records the information which shows whether it changes seamlessly. It is the angle-type section, and in changing seamlessly, when that is not right, it records "NSML" for "SML" as a value.

[0541] VOBU initiation address register C_FVOBU_SA_reg of the cel beginning records a cel head VOBU starting address. The value shows the distance from the logical sector of the head cel of VOBS (VTSTT_VOBS) for VTS titles with the number of sectors, and records this number of sectors.

[0542] VOBU initiation address register C_LVOBU_SA_reg of the cel last records a cel last VOBU starting address. The value shows distance with the number of sectors from the logical sector of the head cel of VOBS (VTSTT_VOBS) for VTS titles, and records this number of sectors.

[0543] Next, the decoding table of drawing 63 is explained. As shown in this drawing, a decoding table consists of the un-seamless multi-angle-type information register section, the seamless multi-angle-type information register section, the VOBU information register section, and the seamless playback register section.

[0544] The un-seamless multi-angle-type information register section contains NSML_AGL_C1_DSTA_reg-NSML_AGL_C9_DSTA_reg.

[0545] N Record NSML_AGL_C1_DSTA-NSML_AGL_C9_DSTA in the PCI packet shown in drawing 20 on SML_AGL_C1_DSTA_reg-NSML_AGL_C9_DSTA_reg.

[0546] The seamless multi-angle-type information register section contains SML_AGL_C1_DSTA_reg-SML_AGL_C9_DSTA_reg.

[0547] S Record SML_AGL_C1_DSTA-SML_AGL_C9_DSTA in the DSI packet shown in

drawing 20 on ML_AGL_C1_DSTA_reg-SML_AGL_C9_DSTA_reg. The VOBU information register section contains VOBU last address register VOBU_EA_reg.

[0548] VOBU_EA in the DSI packet shown in drawing 20 is recorded on VOBU information register VOBU_EA_reg.

[0549] The seamless playback register section Interleave unit flag register ILVU_flag_reg, Unit-end flag register UNIT_END_flag_reg, ILVU last pack address register ILVU_EA_reg, following interleave unit starting address NT_ILVU_SA_reg, Head video frame display start time register VOB_V_SPTM_reg in VOB, Last video frame display end time register VOB_V_EPTM_reg in VOB, Audio playback stopping time 1 register VOB_A_GAP_PTM1_reg, Audio playback stopping time 2 register VOB_A_GAP_PTM2_reg, audio playback halt period 1 register VOB_A_GAP_LEN1, and audio playback halt period 2 register VOB_A_GAP_LEN2 are included.

[0550] Interleave unit flag register ILVU_flag_reg shows whether VOBU exists in an interleave field, and when it exists in an interleave field and does not exist "ILVU" in an interleave field, it records "N_ILVU."

[0551] Unit-end flag register UNIT_END_flag_reg records the information this VOBU indicates it to be whether it is the last VOBU of ILVU, when VOBU exists in an interleave field. Since ILVU is a continuation read-out unit, if VOBU read now is VOBU of the last of ILVU and it is not the last VOBU about "END", it will record "N_END."

[0552] ILVU last pack address register ILVU_EA_reg records the address of the last pack of ILVU with which this VOBU belongs, when VOBU exists in an interleave field. The address is the number of sectors from NV of this VOBU here.

[0553] Following ILVU initiation address register NT_ILVU_SA_reg records the starting address of the next ILVU, when VOBU exists in an interleave field. The address is the number of sectors from NV of this VOBU here.

[0554] Head video frame display start time register VOB_V_SPTM_reg in VOB records the time of day which starts the display of the head video frame of VOB.

[0555] Last video frame display end time register VOB_V_EPTM_reg in VOB records the time of day which the display of the last video frame of VOB ends.

[0556] The period when audio playback halt period 1 register VOB_A_GAP_LEN1_reg stops audio playback for the time amount which audio playback stopping time 1 register VOB_A_GAP_PTM1_reg makes suspend audio playback is recorded.

[0557] It is the same also about audio playback stopping time 2 register VOB_A_GAP_PTM2_reg and audio playback halt period 2 register VOB_A_GAP_LEN2.

[0558] Next, actuation of the DVD decoder DCD concerning this invention which showed the block diagram to drawing 26 is explained, referring to the DVD decoder flow shown drawing 69.

[0559] Step # 310202 is a step which evaluates whether the disk was inserted, and if a disk is set, it will progress to step #310204.

[0560] Step # In 310204, it progresses to step #310206, after reading volume file information VFS of drawing 22.

[0561] Step # In 310206, the video manager VMG who shows drawing 22 is read, VTS to reproduce is extracted, and it progresses to step #310208.

[0562] Step # In 310208, from the managed table VTSI of VTS, video title set menu address information VTSM_C_ADT is extracted, and it progresses to step #310210.

[0563] Step # In 310210, based on VTSM_C_ADT information, video title set menu VTSM_VOBS is read from a disk, and a title selection menu is displayed. According to this menu, a user chooses a title. In this case, if it is a title not only containing a title but an audio number, a subimage number, and a multi-angle type, an angle-type number will be inputted. If a user's input finishes, it will progress to the following step #310214.

[0564] Step # It progresses to step #310216, after extracting VTS_PGCI#J corresponding to the title number which the user chose from a managed table by 310214.

[0565] Playback of PGC is started by the following step #310216. Decoding will be ended if playback of PGC is completed. Henceforth, when reproducing another title, if there is a key input of a user in the scenario selection section, it can realize by control of returning to the title menu display of step #310210.

[0566] Next, with reference to drawing 64, playback of PGC of step #310216 described previously is explained in more detail. PGC playback step #310216 consist of step #31030, #31032, #31034, and #31035 like illustration.

[0567] Step # In 31030, the decoding system table shown in drawing 62 is set up. Angle-type number register ANGLE_NO_reg, VTS number register VTS_NO_reg, PGC number register PGC_NO_reg, audio ID register AUDIO_ID_reg, and subimage ID register SP_ID_reg are set up by user actuation in the scenario selection section 2100.

[0568] If it is decided that PGC to reproduce will be a meaning because a user chooses a title, the corresponding cel information (C_PBI) will be extracted and it will be set as a cel information register by it. The registers to set up are CBM_reg, CBT_reg, SPF_reg, IAF_reg, STCDF_reg, SACF_reg, C_FVOBU_SA_reg, and C_LVOBU_SA_reg.

[0569] The data transfer processing to the stream buffer of step #31032 and data decoding in the stream buffer of step #31034 are started to juxtaposition after a setup of a decoding system table.

[0570] Here, the data transfer processing to the stream buffer of step #31032 is related with the data transfer from Disk M to the stream buffer 2400 in drawing 26. That is, it is the processing which reads required data from Disk M and is transmitted to the stream buffer 2400 according to the title information which the user chose, and the playback control information (nub pack NV) described in the stream.

[0571] On the other hand, step #31034 are a part which performs processing which

decodes the data in the stream buffer 2400 and is outputted to a video outlet 3600 and the audio output 3700 in drawing 26. That is, it is the processing which decodes the data stored in the stream buffer 2400, and is reproduced. These step #31032 and step #31034 operate to juxtaposition.

[0572] Step # 31032 is explained in more detail hereafter.

[0573] Step # It evaluates whether after being a cel unit and completing processing of one cel, processing of PGC ended processing of 31032 by the following step #31035. If processing of PGC is not completed, the decoding system table corresponding to the following cel is set up by step #31030. It carries out until PGC ends this processing.

[0574] Next, actuation of step #31032 is explained with reference to drawing 70. Data transfer processing step #3102 to a stream buffer consist of step #31040, #31042, #31044, #31046, and #31048 like illustration.

[0575] Step # 31040 is a step as which a cel estimates whether it is a multi-angle type. If it is not a multi-angle type, it will progress to step #31044.

[0576] Step # 31044 is a processing step in a non-multi angle type.

[0577] On the other hand, if it is a multi-angle type in step #31040, it will progress to step #31042. These step #31042 are a step which evaluates that it is a seamless angle type.

[0578] If it is a seamless angle type, it will progress to the step of the seamless multi-angle type of step #31046. On the other hand, if it is not a seamless multi-angle type, it will progress to the step of the un-seamless multi-angle type of step #31048.

[0579] Next, with reference to drawing 71, non-multi angle-type processing of step #31044 described previously is explained in more detail. un--- multi-angle-type processing step #31044 consist of step #31050, #31052, and #31054 like illustration.

[0580] First, in step #31050, it evaluates that it is an interleave block. If it is an interleave block, it will progress to non-multi angle-type interleave block processing of step #31052.

[0581] Step # 31052 is a processing step [in / exist / branching or association which makes seamless connection / for example, / a multi-scene].

[0582] On the other hand, if it is not an interleave block, it will progress to non-multi angle-type contiguous-block processing of step #31054.

[0583] Step # 31054 is processing in case branching and association do not exist.

[0584] Next, with reference to drawing 72, processing of a non-multi angle-type interleave block of step #31052 described previously is explained in more detail.

[0585] Step # It jumps to the VOBU start address (C_FVOUB_SA_reg) of a cel head by 31060.

[0586] Furthermore, if it explains in detail, in drawing 26, the address data (C_FVOBU_SA_reg) currently held in the decoding system control section 2300 will be given to the device control section 2002 through St53. After the device control section 2002 controls a motor 2004 and the signal-processing section 2008, moves a

head 2006 to the predetermined address, reads data and performs signal processing, such as ECC, in the signal-processing section 2008, it transmits the VOBU data of a cel head to the stream buffer 2400 through St61, and progresses to step #31062.

[0587] Step # In 31062, in the stream buffer 2400, the DSI packet data in the nub pack NV data shown in drawing 20 are extracted, a decoding table is set up, and it progresses to step #31064. As a register set up here, there are ILVU_EA_reg, NT_ILVU_SA_reg, VOB_V_SPTM_reg, VOB_V_EPTM_reg, VOB_A_STP_PTM1_reg, VOB_A_STP_PTM2_reg, VOB_A_GAP_LEN1_reg, and VOB_A_GAP_LEN2_reg.

[0588] Step # In 31064, the data from a cel head VOBU start address (C_FVOBU_SA_reg) to an interleave unit end address (ILVU_EA_reg), i.e., the data for one ILVU, are transmitted to the stream buffer 2400, and it progresses to step #31066. Furthermore, if it explains in detail, the address data (ILVU_EA_reg) currently held in the decoding system control section 2300 of drawing 26 will be given to the device control section 2002 through St53. After the device control section 2002 controls a motor 2004 and the signal-processing section 2008, reads the data to the address of ILVU_EA_reg and performs signal processing, such as ECC, in the signal-processing section 2008, it transmits the data for ILVU of a cel head to the stream buffer 2400 through St61. Thus, the data for 1 interleave unit which continues on a disk can be transmitted to the stream buffer 2400.

[0589] Step # 31066 estimates whether all the interleave units within an interleave block were transmitted. If it is the interleave unit of the interleave block last, "0x7FFFFFFF" which shows termination as the address read to a degree is set as register NT_ILVU_SA_reg. Here, if it has finished transmitting all the interleave units within an interleave block, it progresses to step #31068.

[0590] Step # In 31068, it jumps to the address (NT_ILVU_SA_reg) of the interleave unit reproduced next, and progresses to step #31062. About a jump device, it is the same as that of the above-mentioned.

[0591] About step #31062 or subsequent ones, it is the same as that of the above-mentioned.

[0592] On the other hand, in step #31066, if it has finished transmitting all the interleave units within an interleave block, step #31052 will be ended.

[0593] Thus, in step #31052, one cell data is transmitted to the stream buffer 2400.

[0594] Next, with reference to drawing 73, processing of the non-multi angle-type contiguous block of step #31054 described previously is explained.

[0595] Step # It jumps to the VOBU start address (C_FVOUB_SA_reg) of a cel head by 31070, and progresses to step #31072. About a jump device, it is the same as that of the above-mentioned. Thus, the VOBU data of a cel head are transmitted to the stream buffer 2400.

[0596] Step # In 31072, in the stream buffer 2400, the DSI packet data in the nub pack NV data shown in drawing 20 are extracted, a decoding table is set up, and it

progresses to step #31074. As a register set up here, there are VOBU_EA_reg, VOB_V_SPTM_reg, VOB_V_EPTM_reg, VOB_A_STP_PTM1_reg, VOB_A_STP_PTM2_reg, VOB_A_GAP_LEN1_reg, and VOB_A_GAP_LEN2_reg.

[0597] Step # In 31074, the data from a cel head VOBU start address (C_FVOBU_SA_reg) to a VOBU end address (VOBU_EA_reg), i.e., the data for one VOBU, are transmitted to the stream buffer 2400, and it progresses to step #31076. Thus, the data for 1VOBU which continues on a disk can be transmitted to the stream buffer 2400.

[0598] Step # 31076 estimates whether the data transfer of a cel was completed. If it has finished transmitting all VOBU(s) in a cel, the following VOBU data are read continuously and it progresses to step #31070.

[0599] It is the same as that of the above-mentioned after step #31072.

[0600] On the other hand, in step #31076, if it has finished transmitting all the VOBU data in a cel, step #31054 will be ended. Thus, in step #31054, one cell data is transmitted to the stream buffer 2400.

[0601] Next, with reference to drawing 74, other approaches about non-multi angle-type processing of step #31044 described previously are explained.

[0602] Step # It jumps to the VOBU start address (C_FVOUB_SA_reg) of a cel head by 31080, the VOBU data of a cel head are transmitted to the stream buffer 2400, and it progresses to step #31081.

[0603] Step # In 31081, in the stream buffer 2400, the DSI packet data in the nub pack NV data shown in drawing 20 are extracted, a decoding table is set up, and it progresses to step #31082. As a register set up here, there are SCR_buffer, VOBU_EA_reg, ILVU_flag_reg, UNIT_END_flag_reg, ILVU_EA_reg, NT_ILVU_SA_reg, VOB_V_SPTM_reg, VOB_V_EPTM_reg, VOB_A_STP_PTM1_reg, VOB_A_STP_PTM2_reg, VOB_A_GAP_LEN1_reg, and VOB_A_GAP_LEN2_reg.

[0604] Step # In 31082, the data from a cel head VOBU start address (C_FVOBU_SA_reg) to a VOBU end address (VOBU_EA_reg), i.e., the data for one VOBU, are transmitted to the stream buffer 2400, and it progresses to step #31083.

[0605] Step # 31083 estimates whether all VOBU(s) of a cel were transmitted.

[0606] If all are transmitted, this step #31044 will be ended. If the transfer has not finished, it progresses to step #31084.

[0607] Step # 31084 estimates whether it is VOBU of the interleave unit last. If it is not VOBU of the interleave unit last, it is return to step #31081. If that is right, it will progress to step #31085. Thus, the data for one cel are transmitted to the stream buffer 2400 per VOBU.

[0608] About the processing after step #31081, it is as above-mentioned.

[0609] Step # 31085 estimates whether it is ILVU of the last of an interleave block. If it is ILVU of the last of an interleave block, this step #31044 will be ended, otherwise, it will progress to step #31086.

[0610] Step # It jumps to the address (NT_ILVU_SA_reg) of the following interleave unit by 31086, and progresses to step #31081. Thus, the data for one cel can be transmitted to the stream buffer 2400.

[0611] Next, with reference to drawing 75, processing of the seamless multi-angle type of step #31046 described previously is explained.

[0612] Step # It jumps to the VOBU start address (C_FVOUB_SA_reg) of a cel head by 31090, and progresses to step #31091. About a jump device, it is the same as that of the above-mentioned. Thus, the VOBU data of a cel head are transmitted to the stream buffer 2400.

[0613] Step # In 31091, in the stream buffer 2400, the DSI packet data in the nub pack NV data shown in drawing 20 are extracted, a decoding table is set up, and it progresses to step #31092. As a register set up here, there are ILVU_EA_reg, SML_AGL_C1_DSTA_reg-SML_AGL_C9_DSTA_regVOB_V_SPTM_reg, VOB_V_EPTM_reg, VOB_A_STP_PTM1_reg, VOB_A_STP_PTM2_reg, VOB_A_GAP_LEN1_reg, and VOB_A_GAP_LEN2_reg.

[0614] Step # In 31092, the data from a cel head VOBU start address (C_FVOBU_SA_reg) to an ILVU end address (ILVU_EA_reg), i.e., the data for one ILVU, are transmitted to the stream buffer 2400, and it progresses to step #31093. Thus, the data for 1ILVU which continues on a disk can be transmitted to the stream buffer 2400.

[0615] Step # In 31093, ANGLE_NO_reg is updated and it progresses to step #31094. Here, in the user actuation 2100, i.e., the scenario selection section of drawing 26, when an angle type is changed, this angle-type number is reset to register ANGLE_NO_reg.

[0616] Step # 31094 estimates whether the data transfer of an angle-type cel was completed. If it has finished transmitting all ILVU(s) in a cel, if that is not right, it will end to step #31095.

[0617] Step # In 31095, it jumps about the following angle type (SML_AGL_C#n_reg), and progresses to step #31091. Here, SML_AGL_C#n_reg is the address corresponding to the angle type updated by step #31093. Thus, the data of the angle type set up by user actuation can be transmitted to the stream buffer 2400 per ILVU.

[0618] Next, with reference to drawing 65, processing of the above-mentioned un-seamless multi-angle type of step #31048 is explained.

[0619] Step # It jumps to the VOBU start address (C_FVOUB_SA_reg) of a cel head by 31100, and progresses to step #31101. About a jump device, it is the same as that of the above-mentioned. Thus, the VOBU data of a cel head are transmitted to the stream buffer 2400.

[0620] Step # In 31101, in the stream buffer 2400, the data in the nub pack NV data shown in drawing 20 are extracted, a decoding table is set up, and it progresses to step 31102. As a register set up here, there are VOBU_EA_reg,

NSML_AGL_C1_DSTA_reg-NSML_AGL_C9_DSTA_regm, VOB_V_SPTM_reg, VOB_V_EPTM_reg, VOB_A_STP_PTM1_reg, VOB_A_STP_PTM2_reg, VOB_A_GAP_LEN1_reg, and VOB_A_GAP_LEN2_reg.

[0621] Step # In 31102, the data from a cel head VOBU start address (C_FVOBU_SA_reg) to a VOBU end address (VOBU_EA_reg), i.e., the data for one VOBU, are transmitted to the stream buffer 2400, and it progresses to step #31103. Thus, the data for 1VOBU which continues on a disk can be transmitted to the stream buffer 2400.

[0622] Step # In 31103, ANGLE_NO_reg is updated and it progresses to step #31104. Here, in the user actuation 2100, i.e., the scenario selection section of drawing 26, when an angle type is changed, this angle-type number is reset to register ANGLE_NO_reg.

[0623] Step # 31104 estimates whether the data transfer of an angle-type cel was completed. If it has finished transmitting all VOBU(s) in a cel, it progresses to step #31105, otherwise, ends.

[0624] Step # It jumps about the following angle type (NSML_AGL_C#n_reg) by 31105, and progresses to step #31106. Here, NSML_AGL_C#n_reg is the address corresponding to the angle type updated by step #31103. Thus, the data of the angle type set up by user actuation can be transmitted to the stream buffer 2400 per VOBU.

[0625] Step # In 31106, when performing an angle-type change at a high speed, it is an effective step, and the stream buffer 2400 is cleared. The data of the angle type changed newly can be reproduced by clearing a stream buffer here, without reproducing the data of the angle type which is not decoded. That is, it can respond early more to user actuation.

[0626] In the DVD decoder of this invention, it is important to shift to processing of the next data read-out quickly from termination detection of data, such as the interleave units ILVU and VOBU, and to read data efficiently in the seamless playback which is especially the chief aim of this invention.

[0627] With reference to drawing 66, the structure of the stream buffer 2400 and actuation which can carry out efficient operation of the termination detection of the interleave unit ILVU are explained briefly.

[0628] The stream buffer 2400 consists of the VOB buffer 2402, a system buffer 2404, a nub pack extractor 2406, and a data counter 2408.

[0629] A system buffer 2404 once stores the data of title management data VTSI (drawing 16) contained in St61 from the bit stream playback section 2000, and outputs the control information St 2450 (St63), such as program chain information VTS_PGC.

[0630] The VOB buffer 2402 once stores the VOB data VTSTT_VOB (drawing 16) data for titles contained in St61, and outputs them as input stream St67 to the system decoder 2500.

[0631] The VOB data inputted into the VOB buffer 2402 are inputted into coincidence,

and the nub pack extractor 2406 extracts the nub pack NV from VOB data, extracts COBU_EA of the VOBU last pack address or ILVU last pack address ILVU_EA which is further shown in drawing 20 and which is DSI information DSI_GI, and generates pack address information St2452 (St63).

[0632] The VOB data inputted into the VOB buffer 2402 are inputted into coincidence, and a data counter 2408 counts each packed data shown in drawing 19 per cutting tool, and the moment packed data carried out the completion of an input, it generates them as a pack input terminate signal St 2454 (St63).

[0633] By the above block configurations, it inputs into the top input and the coincidence to the VOB buffer 2402 of VOBU data of the interleave unit ILVU at the nub pack extractor 2406 and a data counter 2408 in the VOBU data transfer processing to ILVU_EA of step #31064 of the flow chart which drawing 72 shows. Consequently, in a nub pack extractor, the data of ILVU_EA and NT_ILVU_SA can be extracted to a nub pack NV data input and coincidence, and it outputs to them as St2452 (St63) at the decoding system control section 2300.

[0634] In the decoding system control section 2300, St2452 is stored in ILVU_EA_reg and NT_ILVU_SA_reg and a count is started for the number of packs by the pack terminate signal St 2454 from a data counter 2408. The moment that the cutting tool entry of data of the last of the pack of the moment, i.e., the ILVU last, that the input of the packed data of the last of ILVU is completed is completed based on the above-mentioned counted value and above-mentioned ILVU_EA_reg of the number of packs is detected, and the decoding system control section 2300 gives directions so that it may read to the sector address shown in NT_ILVU_SA_reg and a location may be moved to the bit stream playback section 2000. In the bit stream playback section, it moves to the sector address shown in NT_ILVU_SA_reg, and read-out of data is started.

[0635] In the above actuation, read-out processing to termination detection of ILVU and the next ILVU can be performed efficiently.

[0636] Although this operation gestalt explained the case where the MBS data from a disk inputted without buffering into the stream buffer 2400 in the bit stream playback section 2000 When the buffer for processing of ECC is in the signal-processing section 2008 of the bit stream playback section 2000 Directions are given so that it may read to the sector address shown in NT_ILVU_SA_reg after detecting completion of an input of the packed data of the last of the above-mentioned ILVU and clearing the internal buffer of the bit stream playback section 2000 further, though natural and a location may be moved.

[0637] By performing such processing, even when buffers, such as ECC processing, are in the bit stream playback section 2000, data playback of ILVU can be performed efficiently.

[0638] Moreover, when the buffer for ECC processing for ECC processing is in the bit

stream playback section 2000 as mentioned above, a data transfer can be efficiently performed by having a function equivalent to the data counter 2408 of drawing 66 in the input section of the ECC processing buffer. That is, in the bit stream playback section 2000, directions are given to the bit stream playback section 2000 so that the completion signal of a pack input to the buffer for ECC processing may be read to the sector address which generates St62 and is shown in NT_ILVU_SA_reg in the decoding system control section 2300 based on St62 and a location may be moved. As mentioned above, even when the function which buffers the data from a disk is in the bit stream playback section 2000, data transfer can be performed efficiently.

[0639] Moreover, the same equipment and the same approach can be fundamentally used also about termination detection of VOBU with the above-mentioned equipment and the approach of having explained the interleave unit ILVU to the example. That is, it is applicable also to termination detection of VOBU by considering storing in above-mentioned ILVU_EA, the extract of NT_ILVU_SA and ILVU_EA_reg, and NT_ILVU_SA_reg as the extract of VOBU_EA, and storing in VOBU_EA_reg. That is, it is effective in step #31074, step #31082, step #31092, and the VOBU data transfer processing to VOBU-EA-reg in step #31102. By the above processings, the data of ILVU or VOBU can be read efficiently.

[0640] With reference to the decoding flow, next drawing 67 from the Stream buffer, decoding in the stream buffer of step #31034 shown in drawing 64 is explained.

[0641] Step # 31034 consists of step #31110, step #31112, step #31114, and step #31116 like illustration.

[0642] Step # 31110 performs data transfer in the pack unit from the stream buffer 2400 shown in drawing 26 to the system decoder 2500, and progresses to step #31112.

[0643] Step # 31112 performs data transfer to each buffer 2600, i.e., a video buffer, the subpicture buffer 2700, and the audio buffer 2800 for the packed data transmitted from the stream buffer 2400.

[0644] audio ID register AUDIO_ID_reg contained in the scenario information register shown in ID of the audio which the user chose, and a subimage, i.e., drawing 62, by step #31112 -- secondary -- Stream ID and Substream ID in the packet header indicated to be image ID register SP_ID_reg to drawing 19 are compared, a packet in agreement is distributed to each buffer (a video buffer 2600, the audio buffer 2700, subpicture buffer 2800), and it progresses to step #31114.

[0645] Step # 31114 controls the decoding timing of each decoder (a video decoder, a subpicture decoder, audio decoder), i.e., synchronous processing between each decoder is performed and it progresses to step #31116. Step # The detail of synchronous processing of each decoder of 31114 is mentioned later.

[0646] Step # 31116 performs decoding of each EREMENTARI. That is, a video decoder reads data from a video buffer, and performs decoding. Similarly, a subpicture decoder also reads data from a subpicture buffer, and performs decoding. An audio

decoder reads data from an audio decoder buffer similarly, and performs decoding. Step #31034 will be ended if decoding finishes.

[0647] Next, with reference to drawing 68, it explains in more detail about step #31114 described previously.

[0648] Step # 31114 consists of step #31120, step #31122, and step #31124 like illustration.

[0649] Step # If the cel to precede and this cel are the steps which evaluate whether it is seamless connection and are seamless connection, 31120 will progress to step #31122, otherwise, will progress to step #31124.

[0650] Step # 31122 performs synchronous processing for seamless.

[0651] On the other hand, step #31124 perform synchronous processing for un-seamless.

[0652] According to this invention, without data breaking off two or more video objects at the time of playback, source data are read and a decoder can be supplied. Moreover, seamless playback can be carried out from the middle of a video object, without playback time of day becoming discontinuity, without breaking off data at the time of playback of two or more video objects with the same die length.

[0653] Moreover, only required data can be supplied to a decoder, without data breaking off two or more video objects at the time of playback. The video object which moreover reproduces two or more video objects with read-out of only required data, without data breaking off at the time of playback can be changed seamlessly.

[0654] Even if it is about two or more video objects in the middle of the playback, the time of the change can be performed quickly. While it is possible to change to an alien-system stream dynamically according to directions at the time of playback of an optical disk even if it is in the middle of playback of a video object, the change can be performed seamlessly.

[0655] The change can both be quickly performed as it is possible to change to other video objects dynamically according to directions at the time of playback of an optical disk even if it is in the middle of playback of the video object.

[0656] the availability on industry -- the approach of carrying out record playback at interleave ****** of the bit stream which starts this invention as mentioned above, and its equipment are suitable for using for the authoring system which can edit the title which consists of bit streams which convey various information according to a request of a user, and can constitute a new title, and if it says further, they fit the digital video disc system developed in recent years and the so-called DVD system.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the DS of a multimedia bit stream.

[Drawing 2] It is drawing showing an authoring encoder.

[Drawing 3] It is drawing showing an authoring decoder.

[Drawing 4] It is drawing showing the cross section of the DVD record medium which has a single recording surface.

[Drawing 5] It is drawing showing the cross section of the DVD record medium which has a single recording surface.

[Drawing 6] It is drawing showing the cross section of the DVD record medium which has a single recording surface.

[Drawing 7] It is drawing showing the cross section of the DVD record medium which has two or more recording surfaces (one side two-layer mold).

[Drawing 8] It is drawing showing the cross section of the DVD record medium which has two or more recording surfaces (one layer mold of double-sided).

[Drawing 9] It is the top view of a DVD record medium.

[Drawing 10] It is the top view of a DVD record medium.

[Drawing 11] It is the development view of an one side two-layer mold DVD record medium.

[Drawing 12] It is the development view of an one side two-layer mold DVD record medium.

[Drawing 13] It is the development view of the one layer mold DVD record medium of double-sided.

[Drawing 14] It is the development view of the one layer mold DVD record medium of double-sided.

[Drawing 15] It is drawing showing the example of a voice wave of the audio data of the multi-angle-type section.

[Drawing 16] It is drawing showing the DS of VTS.

[Drawing 17] It is drawing showing the DS of a system stream.

[Drawing 18] It is drawing showing the DS of a system stream.

[Drawing 19] It is drawing showing the packed-data structure of a system stream.

[Drawing 20] It is drawing showing the DS of the nub pack NV.

[Drawing 21] It is drawing showing the example of a scenario of a DVD multi-scene.

[Drawing 22] It is drawing showing the DS of DVD.

[Drawing 23] It is drawing showing connection of the system stream of multi-angle-type control.
[Drawing 24] It is drawing showing the example of VOB corresponding to a multi-scene.
[Drawing 25] It is drawing showing a DVD authoring encoder.
[Drawing 26] It is drawing showing a DVD authoring decoder.
[Drawing 27] It is drawing showing a VOB set data stream.
[Drawing 28] It is drawing showing a VOB data stream.
[Drawing 29] It is drawing showing an encoding parameter.
[Drawing 30] It is drawing showing the example of a program chain configuration of a DVD multi-scene.
[Drawing 31] It is drawing showing the example of a VOB configuration of a DVD multi-scene.
[Drawing 32] It is drawing showing transition of the amount of data accumulation of a stream buffer.
[Drawing 33] It is drawing showing the data sharing concept for two or more titles.
[Drawing 34] It is drawing showing the example of record of the data sharing for two or more titles.
[Drawing 35] It is drawing showing the example of connection of a multi-scene.
[Drawing 36] It is drawing showing the example of connection of the multi-scene in DVD.
[Drawing 37] It is drawing showing the example of an interleave block configuration.
[Drawing 38] It is drawing showing the example of a VOB block configuration of VTS.
[Drawing 39] It is drawing showing the DS in a contiguous block.
[Drawing 40] It is drawing showing the DS within an interleave block.
[Drawing 41] It is drawing showing the example of an interleave block configuration.
[Drawing 42] It is drawing showing the DS of an interleave unit.
[Drawing 43] It is drawing showing an example of a MARUCHIREI Ted title stream.
[Drawing 44] It is drawing showing the concept of multi-angle-type control.
[Drawing 45] It is drawing showing the example of an audio data configuration of the interleave unit of the multi-angle-type section.
[Drawing 46] It is drawing showing the example of an interleave unit change of multi-angle-type data.
[Drawing 47] It is drawing showing the example of a configuration of the system stream of the multi-angle-type section.
[Drawing 48] It is drawing showing the DS of A-ILVU.
[Drawing 49] It is drawing showing the angle-type change of an A-ILVU unit.
[Drawing 50] It is drawing showing the angle-type change of a VOBU unit.
[Drawing 51] It is drawing showing an encoding control flow chart.
[Drawing 52] It is drawing showing the encoding parameter generation flow chart of an

un-seamless change multi-angle type.
[Drawing 53] It is drawing showing the common flow chart of encoding parameter generation.
[Drawing 54] It is drawing showing the encoding parameter generation flow chart of a seamless change multi-angle type.
[Drawing 55] It is drawing showing the encoding parameter generation flow chart of parental control.
[Drawing 56] It is drawing showing a formatter operation flow chart.
[Drawing 57] It is drawing showing the formatter actuation subroutine flow chart of an un-seamless change multi-angle type.
[Drawing 58] It is drawing showing the formatter actuation subroutine flow chart of a seamless change multi-angle type.
[Drawing 59] It is drawing showing the formatter actuation subroutine flow chart of parental control.
[Drawing 60] It is drawing showing the formatter actuation subroutine flow chart of a single scene.
[Drawing 61] It is drawing showing the encoding parameter generation flow chart of a single scene.
[Drawing 62] It is drawing showing a decoding system table.
[Drawing 63] It is drawing showing a decoding table.
[Drawing 64] It is drawing showing the flow chart of PGC playback.
[Drawing 65] It is drawing showing an un-seamless multi-angle-type decoding flow chart.
[Drawing 66] It is the block diagram of a stream buffer.
[Drawing 67] It is drawing showing the data decoding flow chart in a stream buffer.
[Drawing 68] It is drawing showing the synchronous processing flow chart of each decoder.
[Drawing 69] It is drawing showing the flow chart of a decoder.
[Drawing 70] It is drawing showing the flow chart of the data transfer to a stream buffer.
[Drawing 71] It is drawing showing the decoding flow chart of a non-multi angle type.
[Drawing 72] It is drawing showing the decoding flow chart of the interleave section.
[Drawing 73] It is drawing showing the decoding flow chart of the contiguous-block section.
[Drawing 74] It is drawing showing the decoding flow chart of a non-multi angle type.
[Drawing 75] It is drawing showing a seamless multi-angle-type decoding flow chart.
[Drawing 76] It is drawing showing the example of a multi-angle-type data change.
[Drawing 77] It is drawing showing the example of a packed-data configuration of the interleave unit of the multi-angle-type section.
[Drawing 78] It is drawing showing the example of GOP structure of the interleave unit

of multi-angle-type data.
[Drawing 79] It is drawing showing the example of a packed-data configuration in the interleave unit of the multi-angle-type section.
[Drawing 80] It is drawing showing the example of an audio data configuration of the interleave unit of the multi-angle-type section.